

Fifth Edition

YROR

Young Researchers Overseas Day

12 December 2022
Programme

Venue:

Christian De Duve conference room
Palais des Académies - Paleis der Academiën
Rue Ducale - 1 - Hertogsstraat, 1000 Brussels



Royal Academy for
Overseas Sciences 



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PROGRAMME

08.30 - 09.00 Registration & Poster installation

09.00 - 09.10 Welcome Address, Philippe DE MAEYER, RAOS Permanent Secretary (Belgium)
Introduction, Philippe MUCHEZ, KULeuven & RAOS Member (Belgium)

9.10 - 9.50 **KEYNOTE LECTURE**

From Science to Solidarity: How can we predict, prevent and control emerging infectious diseases globally?

Marc-Alain WIDDOWSON, Director Institute of Tropical Medicine (Belgium)

Discussion

10.00 - 11.00 **ORAL PRESENTATIONS**

SESSION I – A

Thierry SMITH, Royal Belgian Institute of Natural Sciences & RAOS Member, Belgium
Bart DESSEIN, Universiteit Gent & RAOS Member, Belgium

Education for a Multicultural Society: Students', Lecturers', and Administrators' Perceptions of Intercultural Competence Education at Two Ethiopian Universities

AYANA Desta Kebede, Jimma University (Ethiopia)

Monitoring carbon storage potential on spontaneous regrowing forests: A result of the fire exclusion on anthropogenic savannas in the Democratic Republic of Congo

DJIOFACK Brice Y., Royal Museum for Central Africa, Wood Biology Service, & UGent-Woodlab, Laboratory of Wood Technology, Department of Environment (Belgium)

Protecting biodiversity in international waters: Strategies for the Indian Ocean

FOURCHAULT Léa, Écologie des Systèmes et Gestion des Ressources Département de Biologie des Organismes, Faculté des Sciences, Université Libre de Bruxelles; Department of Biology, Faculteit Wetenschappen en Bio-ingenieurswetenschappen, Vrije Universiteit Brussel (Belgium) & Dipartimento de Biologia, Università degli Studi di Firenze (Italy)

Bushmeat consumption vs. conservation. A case study of Itebero and Bunyakiri, DRC

IGUGU Olivier, Expertise Center on Mining Governance, (CEGEMI), UCB (DR Congo)

SESSION I – B

Georges VAN GOETHEM, European Commission & RAOS Member, Belgium
Jan RAMMELOO, Botanic Garden Meise & RAOS Member, Belgium

Assessing the impacts of the local governance in enhancing the resilience of mangrove ecosystems along the coastline of Benin, West Africa

GNANSOUNOU Setondé Constant, Centre for Coastal Management (Africa Centre of Excellence in Coastal Resilience); Department of Fisheries and Aquatic Sciences, School of Biological Sciences; University of Cape Coast (Ghana) & Laboratoire de Biomathématiques et d'Estimations Forestières, Faculty of Agronomic Sciences, University of Abomey-Calavi (Benin) & Department of Geography, Institute of Life-Earth-Environment, University of Namur (Belgium)

Procedural safeguards for combating torture and other forms of ill-treatments in places of police custody. The case of Ethiopia

GEBREHIWOT Abera, KU Leuven (Belgium)

Fluid saturation in pegmatites and its effects on Nb, Ta, and Li mineralization: Insights from the phosphate-rich Buranga dike (Rwanda)

PRADO ARAUJO Fernando, Department of Earth and Environmental Sciences, KU Leuven (Belgium)

Cost-efficient survey designs for monitoring and evaluation of soil-transmitted helminths control programs

KAZIENGA Adama, Department of translational physiology, infectiology and public health, Ghent University (Belgium)

11.00 - 11.45 Coffee break & Poster session (posters 1 till 20)

11.45 - 12.45 **ORAL PRESENTATIONS**

SESSION II – A

Willy BAUWENS, Vrije Universiteit Brussel & RAOS Member, Belgium

Virginie TILOT, UCLouvain, UN, European Commission & RAOS Member, Belgium

Suboptimal Cardiometabolic Health and Dietary Intake Exist at Worrying Levels Among Ugandans Living with HIV

KIYIMBA Tonny, Department of Food Technology, Faculty of Science, Kyambogo University, (Uganda) & Clinical and Experimental Endocrinology, Department of Chronic Diseases and Metabolism, KU Leuven (Belgium)

Carved into bone: The first fossil amphibian “brain”

LEMIERRE Alfred, Centre de Recherche en Paléontologie, CNRS/MNHN/Sorbonne Université (France)

Contribution à la compréhension du statut juridique du Comité International de la Croix-Rouge et du Croissant-Rouge

NGILA KIKUNI Ibrahim, Université Officielle de Bukavu (RD Congo)

To go or not to go when the lava flow is coming: Understanding of evacuation decision of Goma inhabitants during the 2021 free precursors Nyiragongo eruption crisis

MAFUKO NYANDWI Blaise, Department of Earth Sciences, Royal Museum for Central Africa; Geography department, Vrije Universiteit Brussel (Belgium) & Geology department, Université de Goma (DR Congo)

SESSION II – B

Geert VERVAEKE, KU Leuven (Belgium), Universiteit Tilburg (Nederland) & RAOS Member, Belgium

Luc ANDRÉ, Royal Museum for Central Africa & RAOS Member, Belgium

Aedes Virome in Southern Cameroon

MBIGHA DONFACK Karelle Celes, KU Leuven (Belgium), Laboratory of Viral Metagenomics, Rega institute, KU Leuven (Belgium) & Molecular and Cell Biology Laboratory, University of Buea (Cameroon)

Green Building Design Strategy for a house in Phnom Penh from Life Cycle Assessment

LONG Makara, University of Liège (Belgium) & Institute of Technology of Cambodia (Cambodia)

Preparing Vietnamese university students for the international labor market Investigating Content-and-Language-Integrated Learning and Teaching

NGUYEN Phuong Bao Tran, KU Leuven (Belgium) & Can Tho University (Vietnam)

Mobilising academic, indigenous and local knowledge for inclusive agricultural development: A case study in the Upper East region of Ghana

PEDDI Branwen, Ghent University (Belgium)

12.45 - 13.45 Lunch + Poster session (posters 21 till the end)

13.45 - 14.25

KEYNOTE LECTURE

State of scientific and technological research in the Democratic Republic of Congo (DRC)

Nicolas TABA KALULU, Permanent Secretary ACCOS (DR Congo)

Discussion

14.25 - 15.55

ORAL PRESENTATIONS

SESSION III – A

Jean-Luc HORNICK, Université de Liège & RAOS Member, Belgium

Pierre MEERTS, Université Libre de Bruxelles & RAOS Member, Belgium

Les producteurs du charbon de bois au sein du bassin d’approvisionnement de la ville de Lubumbashi (RDC): profil socio-économique, typologie et pratiques

KASANDA MUKENDI Nathan, Faculté des Sciences Agronomiques, Unité de Recherche en Economie et Développement Agricole, Université de Lubumbashi (DR Congo) & Gembloux-Agro Biotech, Unité d’Economie et Développement rural, Université de Liège (Belgique)

Listening to global warming: Assessment of the impact of coral bleaching and marine protection measures in Polynesia through passive acoustic monitoring

RAICK Xavier, Laboratory of Functional and Evolutionary Morphology, Freshwater and Oceanic Science Unit of Research, University of Liège (Belgium)

“Modernist Protestantism” versus “Chinese Superstition”: Sun Yat-sen’s Christian Revolutionary Quest

ROCTUS Jasper, Ghent University (Belgium)

Climate change impacts estimation on the long-term mean annual streamflow of the São Francisco River Basin, Brazil

SIMÕES Fabricio T. A., GEOPS, Université Paris-Saclay (France)

Current and future outdoor thermal comfort in Asia

TOP Sara, Ghent University (Belgium)

Effects of landscape heterogeneity on bird diversity in farmland at multiple spatial scales

ZHENG Hongyan, Agro-Environmental Protection Institute, Ministry of Agriculture and Rural Affairs (China) & Gembloux-Agro BioTech, University of Liège (Belgium)

SESSION III – B

Christa SYS, Universiteit Antwerpen & RAOS Member, Belgium

Philippe DE MAEYER, RAOS Permanent Secretary, Belgium

Multiple mineralization and fluid flow phases in the Central African Copperbelt

TORRES Jessica, Department of Earth and Environmental Sciences, KU Leuven (Belgium)

The ecology of animal personality and the effect on viral infection risk in natural populations of *Mastomys natalensis*

VANDEN BROECKE Bram, Evolutionary Ecology Group, Department of Biology, University of Antwerp (Belgium)

Drawings along the Nile: Documenting the endangered rock art from West Bank Aswan

VANHULLE Dorian, Université libre de Bruxelles/F.R.S.-FNRS (Belgium)

Undoing the development army: A paradigm shift from Transfer of Technology to Agricultural Innovation System in Ethiopian extension

ASMELASH GEBREMARIAM Yemane, Department of Agricultural Economics, Ghent University (Belgium) & Department of Rural Development and Agricultural Extension, Bahir Dar University (Ethiopia)

Campylobacter species occurrences in Ethiopian animals and diseased children: a One-Health approach

MULU LINGEREW Wondemagegn, Department of Medical Laboratory Science, College of Medicine and Health Sciences, Bahir Dar University (Ethiopia) & Laboratory of Microbiology, Department of Biochemistry and Microbiology, Ghent University (Belgium)

Mangrove dispersal disrupted by projected changes in global seawater density

VAN DER STOCKEN Tom, Vrije Universiteit Brussel (Belgium) & Jet Propulsion Laboratory, California Institute of Technology (Caltech) (USA)

15.55 - 16.15 Coffee break & Poster session

16.15 - 16.30 **Conclusion + Best poster award**

Philippe GOYENS, RAOS Past Permanent Secretary, Belgium

POSTER LIST

- 1 Identifying hotspots of soil erosion and proposing targeted catchment restoration using an evidence-based approach in Lake Tana Basin, Ethiopia**
Tirusew ABERE^{1,*}, Hanibal LEMMA², Ellie VERLEYEN³, Olivier EVRARD⁴ & Amaury FRANKL¹
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* Corresponding Author. E-mail: tirusewabere@gmail.com
- 2 Agroecology, Power and the Project for a New Social Fabric in Argentina**
Jonas ADRIAENSSENS^{1,*}, Joost DESSEIN¹ & Jeroen ADAM²
¹ INSPIRA, Department of Agricultural Economics, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, 9000 Ghent, Belgium.
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- 3 Évolution du processus de ravinement dans le bassin versant urbain de la Kimemi (Butembo/RD Congo)**
Jonathan AHADI MAHAMB^{1,2,*}, Mulondi Kayitoghera Gloire^{1,2}, Kapiri Musubao Moïse^{1,2}, Basimine Chuma Géant³ & Muhindo Sahani Walere^{1,2}
¹ Université Catholique du Graben (UCG), Faculté des sciences agronomiques, Département des eaux et forêts, Butembo, BP 29, R D Congo.
² Laboratoire d'Ecologie, Géomorphologie et Géomatique (LEGG), Butembo, BP 29, R D Congo.
³ Faculté d'Agronomie et science de l'Environnement, Université Evangélique en Afrique (UEA), Bukavu, BP 3323, R D Congo.
* Auteur correspondant. E-mail: jonathaahadim@gmail.com
- 4 The world of the Mayans revealed by lidar and satellites**
Jana AMEYE^{1,*}, Mario HERNANDEZ² & Tim VAN DE VOORDE¹
¹ Department of Geography of Ghent University, Ghent, Krijgslaan 281, Belgium.
² International Society for Photogrammetry and Remote Sensing, Hannover, Nienburger Str. 1, Germany.
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- 5 Sustainable Farming Practices among Rural Arable Crop Farmers in Central Nigeria**
Aliyu Akilu BARAU^{1,*} & Manko ABDULKADIR BABATIFIN¹
¹ Department of Agricultural Extension and Rural Development, Usmanu Danfodiyo University, Sokoto, P.M.B. 2346, Nigeria.
* Corresponding Author. E-mail: akilutsafe@yahoo.com
- 6 The Five Viscera Paradigm in Edo Period Japan**
Elias BOUCKAERT^{1,*}
¹ Ghent University, Ghent, 9000, Belgium.
* Corresponding Author. E-mail: Elias.Bouckaert@UGent.be
- 7 L'importance du genre dans la gestion des risques et des catastrophes**
Rood Myard Medgine CELANGE^{1,*}
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* Corresponding Author. E-mail: celangerood@gmail.com
- 8 Root development of Bok choy under the Sandwich compost substrate amendment**
Chooi Lin PHOOI¹, Elisa Azura AZMAN^{1,*} & Roslan ISMAIL^{2,3}
¹ Department of Crop Science, Faculty of Agriculture, University Putra Malaysia 43400 UPM Serdang, Malaysia.
² Department of Land Management, Faculty of Agriculture, University Putra Malaysia 43400 UPM Serdang, Malaysia.
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- 9 Mineralogical and geochemical study of the Au mineralization at Imonga, Maniema (DRC)**
Inge COOLS^{1,*}, Philippe MUCHEZ¹ & Stijn DEWAELE²
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² Ghent University, Department of Geology, Krijgslaan 281 S8, 9000 Gent, Belgium.
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- 10 Sulfones, Sickness and Segregation? The Landscapes of Leprosy Care in Congo (1930-1970)**
Felix DECKX^{1,*}
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- 11 Worrying about next meal: Food acquisition strategies and the experience of hunger among street children in Southwest Ethiopia**
Siyane DERESSA¹ & Joost DESSEIN^{1,*}
¹ Department of Agricultural Economics Ghent university, Ghent, 9000, Belgium.
* Corresponding Author. E-mail: joostdessein@ugent.be
- 12 Variabilité climatique et productivité des pâturages naturels dans la zone soudano-guinéenne du Bénin**
Gildas Louis DJOHY^{1,*}, Boni Sounon BOUKO², Yaya IDRISOU³ & Rachidi SALIOU⁴
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⁴ Laboratoire de Recherche en Biologie Appliquée (LaRBA), Université d'Abomey-Calavi, Cotonou, Bénin.
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- 13 Pratiques sociales autour de la Covid-19 et résilience des acteurs des secteurs de l'artisanat et du commerce au Sud du Bénin**
Moïse DJRALAH^{1,*}
¹ Arlon Campus Environnement, Arlon, Belgique.
* Corresponding Author. E-mail: m.djralah@student.uliege.be
- 14 Mortality in 888 persons living with epilepsy in Rwanda**
Ieme GARREZ^{1,2,*}, Béni H. UWACU³, Fidele SEBERA^{1,3,4}, Peter DEDEKEN^{1,5}, Josiane UMWIRINGIRWA³, Jeannine KAYIRANGWA⁶, Dirk E. TEUWEN¹ & Paul A.J.M. BOON^{1,2}
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⁴ Centre Hospitalier Universitaire Kigali, Rwanda.
⁵ Heilig Hart Ziekenhuis, Lier, Belgium.
⁶ Ruhengeri Referral Hospital, Musanze, Rwanda.
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- 15 Caractérisation de la dynamique récente (1991-2020) de la végétation au Burkina Faso dans le contexte de la variabilité climatique Faso à partir de l'imagerie satellitaire basse résolution**
Koufanou HIEN^{1,*} & Pierre OZER¹
¹ Département des Sciences et Gestion de l'Environnement, UR Sphères, ULiège, Avenue de Longwy 185, Arlon, Belgique.
* Corresponding Author. E-mail: KHien@student.uliege.be
- 16 Wood-borer infestation on mangrove forests of Kenya: Identification, threats and impacts**
Elisha JENOH^{1,*}, Farid DAHDOUH-GUEBAS², Esther KIOKO³ & Nico KOEDAM⁴
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² F. Dahdouh-Guebas, ULB, Bruxelles, Belgium.
³ N. Koedam Pleinlaan, 2, B-1050, Brussels, Belgium.
* Corresponding Author. E-mail: elishamrabu@gmail.com
- 17 Active rheology control of fresh cementitious materials using magnetic field**
Dengwu JIAO^{1,*}, Caijun SHI² & Geert DE SCHUTTER³
¹ Construction Department, Nano and Advanced Materials Institute, Hong Kong, China.
² College of Civil Engineering, Hunan University, Changsha 410082, China.
³ Department of Structural Engineering and Building Materials, Ghent University, 9052 Ghent, Belgium.
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- 18 Understanding individual motivation to protect against volcanic risks among Goma population before the May 2021 Nyiragongo eruption, Virunga volcanic province (DR Congo)**
Blaise MAFUKO NYANDWI^{1,2,3,*}, Matthieu KERVYN², François MUHASHY HABİYAREMYE³, François KERVYN¹ & Caroline MICHELLIER¹
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³ Geology department, Université de Goma (Goma, DR Congo).
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- 19 Differences in volcanic risk perception among Goma's population before the Nyiragongo eruption of May 2021, Virunga volcanic province (DR Congo)**
Blaise MAFUKO NYANDWI^{1,2,3,*}, Matthieu KERVYN², François MUHASHY HABİYAREMYE³, François KERVYN¹ & Caroline MICHELLIER¹
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* Corresponding author. E-mail: blaise.mafuko.nyandwi@vub.be or tmafuko@gmail.com
- 20 Sedimentology of the Kyandamu diamictite in the Katanga Supergroup (DRC): Paleogeographic implications for the Katangan Basin.**
MALANGO MULE¹, Thierry DE PUTTER^{2,*}, Mashala TUMONE¹ & Jacques CAILTEUX²
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² Royal Museum for Central Africa, Tervuren, Belgium.
* Corresponding Author. E-mail: thierry.de.putter@africamuseum.be
- 21 Geometallurgical characterization of the cobalt black ore at Ruashi Cu-Co deposit (Katanga Supergroup, Democratic Republic of the Congo)**
Pascal MAMBWE^{1,2,*}, Michel SHENGO³, Théophile KIDYANYAMA², Philippe MUCHEZ¹ & Mumba CHABU²
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- 22 Structural analysis and evolution of the Cu and Cu (Zn, Pb) mineralizing fluids in the Katanga basin (Democratic Republic of the Congo)**
Pascal MAMBWE^{1,2,*}, Damien DELVAUX³, Stijn DEWAELE⁴, Louis KIPATA² & Philippe MUCHEZ¹
¹ KU Leuven, Dept. Earth and Environmental Sciences, Ore Geology and Geofluid Research Group; Celestijnenlaan 200E, B-3001 Leuven, Belgium.
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⁴ Ghent University, Department of Geology, Krijgslaan 281 S8, B-9000 Gent, Belgium.
* Corresponding author. E-mail: pascal.mambwematanda@kuleuven.be
- 23 Labial-velar consonants in Sakata (Bantu C34): Preliminary phonetic and phonological observations**
Lorenzo MASELLI^{1,2,3,4,*}
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² Universiteit Gent.
³ BantUGent.
⁴ Université de Mons.
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- 24 Customary Authority and State Administration in Haut-Uélé: Between Inclusion and Exclusion**
Baudouin MENA SEBU^{1,*}
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- 25 Uncontrolled exploitation of *Pterocarpus tinctorius* Welw. and associated landscape dynamics in the Kasenga territory: Case of the rural area of Kasomeno (D.R. Congo)**
Médard MPANDA MUKENZA^{1,*}, Héritier KHOJI MUTEYA², Dieu-Donné N'TAMBWE NGHONDA², Raoul KOUAGOU SAMBIENI^{3,4}, François MALAISSE⁵, Sylvestre CABALA KALEBA², Jan BOGAERT⁵ & Yannick USENI SIKUZANI^{2,6}
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³ École Régionale Post-Universitaire d'Aménagement et Gestion Intégrés des Forêts et Territoires Tropicaux (ERAIFT), Kinshasa, R.D. Congo.
⁴ Faculté d'Architecture, Université de Lubumbashi, Lubumbashi, R.D. Congo.
⁵ Unité Biodiversité et Paysage, Gembloux Agro-Bio Tech, Université de Liège, Gembloux, Belgique.
⁶ Centre de Compétences en Planification et Gestion Urbaine, Université de Lubumbashi, Lubumbashi, R.D. Congo.
* Corresponding Author. E-mail: mpandamedard@gmail.com
- 26 Perceptions of forest ecosystems and their management by local populations in the Kasenga territory (Haut-Katanga, Democratic Republic of the Congo)**
Médard MPANDA MUKENZA^{1,*}, Héritier KHOJI MUTEYA², Dieu-Donné N'TAMBWE NGHONDA², Raoul KOUAGOU SAMBIENI^{3,4}, François MALAISSE⁵, Sylvestre CABALA KALEBA², Jan BOGAERT⁵ & Yannick USENI SIKUZANI^{2,6}
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⁶ Centre de Compétences en Planification et Gestion Urbaine, Université de Lubumbashi, Lubumbashi, R.D. Congo.
* Corresponding Author. E-mail: mpandamedard@gmail.com
- 27 Étude de la pollution atmosphérique par les matières particulaires PM_{2,5}, PM₁₀ et les ETM le long de la route Kasapa dans la ville de Lubumbashi, R.D. Congo**
Paul-Didi MPOYO KUMWIMBA^{1,2,*}, Welcome MUYUMBA NONGA³, Patrick D. M. C. KATOTO^{4,5}, Dieudonné TSHIBANDA KABUMANA², Emery KALONDA MUTOMBO², Léon ZEKA MUJINGA⁶, Célestin BANZA LUBABA NKULU⁷ & Crépin KYONA WA NSANGA²
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⁵ Département de Médecine et Centre des Maladies infectieuses, Faculté de Médecine, Université de Stellenbosch, Cape Town, République Sud-Africaine.
⁶ Département de Chimie, Faculté de Polytechnique, Université de Lubumbashi, Lubumbashi, RD Congo.
⁷ Unité de Toxicologie et Environnement, Ecole de Santé Publique, Faculté de Médecine, Université de Lubumbashi, Lubumbashi, RDC.
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- 28 Modélisation de l'érosion hydrique par l'équation universelle de perte de sols révisée (RUSLE) dans le bassin versant Taliha Nord (Nord-Kivu, Est de la République Démocratique du Congo)**
Moïse MUSUBAO KAPIRI^{1,2,*}, Gloire MULONDI KAYITOGHERA¹, Jonathan AHADI MAHAMBA¹, Isaac UZIMATI DJURUA^{1,3}, Hintou KAHAMBU MATIMBYA¹ & Walere MUHINDO SAHANI¹
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- 29 Impact of domestication on Katangan *Vitex* chemical constitution**
Welcome MUYUMBA NONGA^{1,2,3,*}, Désiré NUMBI MUJIKE⁴, Salvius BAKARI AMOURI³, Kahumba BYANGA³, Mylor NGOY SHUTCHA⁴, Jean-Baptiste LUMBA SIMBI⁵, Pierre MEERTS⁶, Edouard NGOY KIHUYA¹, Amandine NACHTERGAE² & Pierre DUEZ²
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- 33 Insécurité alimentaire et résilience au Burkina Faso: Analyse comparée des ménages des Personnes Déplacées Internes (PDI) des centres d'accueil et des ménages locaux dans la commune de Kaya**
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- 42 Gestion des ressources en eau du bassin versant de Guitti au Burkina Faso dans un contexte de changement climatique**
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ORAL PRESENTATIONS

Keynote Lecture

From Science to Solidarity: How can we predict, prevent and control emerging infectious diseases globally?

Marc-Alain WIDDOWSON¹

KEYWORDS. — Emerging Diseases; Epidemics; Prevention and Control; Vaccines; Clinical Research.

SUMMARY. — The recent pandemic that tore through the world came for many epidemiologists as an “expected surprise”. A surprise because we never know exactly when an epidemic or pandemic will arrive or how it will behave, but nonetheless expected because we know that pandemics and epidemics have occurred, and for the foreseeable future will continue to occur.

Pathogens are unpredictable. The risks of a pathogen emerging or re-emerging are increasing with decreasing biodiversity, climate change, deforestation and even urbanisation. Then, once emerged, rapid spread of a pathogen is becoming much more likely in an increasingly interlinked world, not only connected by travel and trade, but also ecologically and geopolitically. What happens in one part of the world can, and often does, have fundamental consequences for us all.

In this evolving context, how can we better predict, prevent and control the emergence of new pathogens, or re-emergence of known ones, and slow or stop the subsequent spread of these microbes? Infectious disease research is fundamental to this; the monitoring of newly emerged and yet-to-emerge pathogens through surveillance and related studies in animals and humans, exploring the drivers of emergence, documenting the shifting epidemiology and risk factors of pathogens, and analysing their structure and make up. These areas of research give us some insights into possible prediction of outbreaks and how microbes might behave in an epidemic or pandemic. This information also allows us to plan, prepare and implement prevention and control measures effectively. And, remarkably, in the last 5 to 7 years, technology may be able to design specific vaccines in a matter of months to combat epidemics.

However, while science and technology are necessary and extremely powerful tools in our fight against infectious diseases, if we are to effectively control epidemic and pandemics worldwide, these are not equally distributed globally. Several barriers can impede equal distribution or access to these technologies such as misinformation or communication, vaccine hesitancy, but also timely accessibility by lower and middle income countries because of reliance on feelings of solidarity by higher income countries and a lack of mechanisms to share these products fairly.

I will illustrate the capricious nature of emerging infectious diseases with examples of key pathogens and the work is that being undertaken to better understand the risk posed by these pathogens as well as how the world we live in and the current ecologic degradation may be increasing these risks of emergence. Lastly, I will discuss how we can reduce the risk of spillover or further epidemic spread of existing pathogens.

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Session I – A

Education for a Multicultural Society: Students', Lecturers', and Administrators' Perceptions of Intercultural Competence Education at Two Ethiopian Universities

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KEYWORDS. — Intercultural Competence; Education; Students Voice; Lecturers Voice; Administrators Voice; Ethiopia.

SUMMARY. — Ethiopia is a land of diversity. In response to local and global demands for democratic culture and intercultural dialogue, Ethiopian universities admit students from various nations, ethnic groups, and cultures, hire staff from diverse cultures, and modify their policy and legislation to address equity, diversity, and cultural pluralisms. Yet, the current approach has not led to a substantial increase in successful intercultural contacts or cooperation among graduates from different ethnicities and cultures. Consequently, this Ph.D. study aims to map the current situation in Ethiopian Universities as regards the promotion of intercultural communication competence (hereinafter, ICC) via education and, from there, to provide grounded advice on how to proceed to further enhance Ethiopian graduates' ICC.

The study is guided by a systematic review of the literature and is situated in a pragmatic paradigm, a partnering philosophy of mixed-research designs. The study employs an exploratory mixed research design and multiple data gathering tools to arrive at a comprehensive contextual model of ICC. Data analysis includes exploratory and inferential statistics to arrive at reasonable assumptions about the larger population from which the study samples were taken. Potential findings of the Ph.D. project include developing a typology of models for the enhancement of ICC of university students through university education; Assessing students', lecturers', and university's initiatives to promote ICC; Studying university policy makers' views regarding the promotion of ICC via university education; Presenting grounded advice on how to proceed to enhance ICC through university education; Providing wider-reaching advice regarding the implementation of intercultural education in Ethiopian Universities.

The PhD project contributes to the education of future generations of Ethiopian University students through proposing a grounded model for the intensification of efforts to promote ICC and multilingualism among university graduates.

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Monitoring carbon storage potential on spontaneous regrowing forests: A result of the fire exclusion on anthropogenic savannas in the Democratic Republic of Congo

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KEYWORDS. — Forest Regeneration; Carbon Stocks; Tropical Rainforest; Climate Mitigation.

SUMMARY. — Among the multiple factors that limit tree success and the uptake of atmospheric CO₂ in savanna, fire appears to be the most widespread (Hoffmann *et al.*, 2012). Therefore, discontinuing burning regimes may allow forests to recolonize savannas and C stocks to recover (Deklerck *et al.*, 2019). This method of managing savanna has been tested in the Manzonzi area (Kongo Central Province, Democratic Republic of Congo) since 2005, where the local community has preserved a 200 ha block of savanna with the support of WWF. To better quantify (i) the forest recolonization success over savanna as well as (ii) the efficiency of C storage in this area, 101 permanent plots (40.4 ha in total) were installed in 2010, remeasured in 2014 and 2022. The inventories (at the threshold of 6.5 cm DBH) carried out in 2010 and 2014 allowed to classify tree species into three categories *sensu* Deklerck *et al.* 2019: savanna, transition, and forest specialists. Between 2010 and 2022, stem density switched from 221.5 to 52.6 tree/ha, from 19.6 to 64.1 tree/ha and from 30.8 to 232.2 tree/ha for savanna specialists (e.g. *Hymenocardia acida* and *Maprounea africana*), transition specialists (e.g. *Anthocleista vogelii* and *Macaranga spinosa*) and forest specialists (e.g. *Xylopia aethiopica* and *Albizia adianthifolia*) respectively. High mortality of savanna specialists was compensated by the recruitment of forest specialists. The number of tree species found in the experiment thus increased from 58 to 180 between 2010 and 2022. Aboveground C stocks switched from 6.5 to 1.9 Mg/ha, and from 1.3 to 4.1 Mg/ha, for savanna and transition specialists, respectively, while they significantly increased from 1.8 to 8.8 Mg/ha for forest specialists. In contrast to the results of Deklerck *et al.* (2019) forests may recolonize the savanna and carbon stocks may recover. However, little is known about the success and speed of tropical forest recovery, while such information is vital for a better quantification of efforts to reduce emissions from deforestation and forest degradation (REDD +, the total amount of Aboveground C stocks significantly increased from 9.68 to 14.95 Mg/ha. This experiment is potentially a reference in Central Africa firstly in terms of savanna fire management, and secondly in terms of the recolonization of savannas by forest and the related increase of C stocks. Further analysis of our dataset will allow to better characterize the regrowing forests success and the long-term C recovery trajectories in DRC.

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Protecting biodiversity in international waters: Strategies for the Indian Ocean

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Stefano CANNICCI³ & Farid DAHDOUH-GUEBAS^{1,2}

KEYWORDS. — Conservation; Marine Spatial Planning; Pelagic Predators; Seamounts; Vents.

SUMMARY. — Since the 1970s, industrial activities have expanded into the open ocean and seabed, including areas beyond national jurisdiction (ABNJ). The fishing, shipping, and deep-sea mining sectors are major drivers of this 'blue acceleration', where direct exploitation, close-range interactions, and stressors associated with habitat degradation diminish species abundance and distribution. While negotiations for a global treaty to protect biodiversity in ABNJ are ongoing, there are few fully protected marine reserves in ABNJ, and none in the Indian Ocean. We use a systematic conservation planning approach combining ecological and socio-economic data from the fishing, shipping, and deep-sea mining sectors to identify optimal areas for surface-to-seabed marine reserves. We create sector-specific spatial plans, where conservation targets are met at the lowest cost possible to each sector. We then create a cross-sectoral spatial plan that considers the interests of all sectors simultaneously. We show that the cross-sectoral spatial plan meets the same conservation targets at little additional cost, although it generates a more fragmented reserve network. The cross-sectoral spatial plan most resembled the fishing-specific plan, which highlights the widespread footprint of the fishing sector in ABNJ. However, knowing the impacts that shipping and deep-sea mining have on marine biodiversity, and given the low additional costs linked to their inclusion in reserve design, we recommend that decision-makers consider cross-sectoral spatial planning for conservation in ABNJ.

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Bushmeat consumption vs. conservation. A case study of Itebero and Bunyakiri, DRC

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KEYWORDS. — Natural Resources Management; Interviews; Kahuzi-Biega National Park.

SUMMARY. — The culture of bushmeat consumption is ingrained in the dietary habits of forest populations in Central Africa. The same is true for the communities living around the Kahuzi-Biega National Park (KBNP) in the eastern Democratic Republic of Congo. When it was created in 1970, this park had an area of 60,000 ha, but in 1975, this area was revised and expanded to 600,000 ha. Populations that depended on the resources of these forests have seen their access limited. Tensions arose to protest against this situation. But, with the support of its ecoguards, the KBNP has struggled to manage all the tensions around this protected area. The question then arises as to how the inhabitants of Itebero and Bunyakiri continue to consume bushmeat despite the law enforcement?

We used observation and interviews with a few key informants to understand bushmeat consumption in this area. These interviews were conducted between April and May 2022 with local administrative officials, female vendors and restaurant owners, local youth leaders, hunters, and conservation officers. The observation and interviews revealed that the bushmeat trade and distribution is managed by a few people with strong contacts within the ecoguards. In this way, a woman who has a brother and a son who are ecoguards, is the focal point of the bushmeat traffic. It is even from her that hunters come to stock up on cartridges before going out hunting. While in other restaurants there may be a shortage of bushmeat, his restaurant has never experienced a deficit. It is also easy to come across some of the elite in Itebero and Bunyakiri coming to buy from this lady. It is also observed in this environment that when a protected species is prepared in a restaurant, it is given the name of a non-protected species to avoid prosecution. And sometimes, to avoid being prosecuted by conservation officers, hunters must offer part of their booty to local authorities and members of the security and environmental services.

It turns out that bushmeat trafficking is easily carried out with the complicity of some conservation officers. We have learned that hunters sometimes communicate with ecoguards deployed in the field to find out where and when they can be deployed in order to take precautions. Also, according to local administrative officials, the establishment of their area as a protected area has contributed to the over-exploitation of wildlife resources in this area, because in the days before the Park, forest management was communal and the traditional local chief was primarily responsible. In concrete terms, a person from outside the clan could not afford to go hunting in someone else's forest and the tools to be used for hunting were controlled. In the case of the latter, it is not possible to determine whether or not a person is a member of the clan, or whether or not a person is a member of the clan. Finally, it is observed that the measures taken by the park to curb the trafficking of bushmeat are not effective.

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Session I – B

Assessing the impacts of the local governance in enhancing the resilience of mangrove ecosystems along the coastline of Benin, West Africa

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KEYWORDS. — Coastal Zone Management; Habitat Risk Assessment; Mono Transboundary Biosphere Reserve; Conservation.

SUMMARY. — Literature on conservation science has documented the increasing use of the co-management approach to effectively conserve natural resources. Co-management refers to the process whereby power is given to local population to manage their resources themselves (Aheto *et al.*, 2016). Although some studies found the co-management approach as highly effective, others also reported some uncertainties associated to this conservation approach such as the overexploitation of the resources, weak law enforcement and lack of consensus on the use of the resources. Using the mono transboundary biosphere reserve (MTBR) which is a transboundary coastal reserve located between Benin and Togo as case study, this work assessed the effectiveness of the co-management approach for mangrove conservation in West Africa. Primary data was collected in two protected sites of the reserve (one in Togo and the other in Benin). Exploratory sequential mixed method via in-depth interviews ($n = 17$), focus group discussions ($n = 14$), household surveys ($n = 274$) and expert-based surveys ($n = 10$) were carried out, and data was analyzed using the InVEST-based Habitat Risk Assessment (HRA) model (Arkema *et al.* 2015), chi-square tests and simple probability of likelihood. We found that the co-management approach has lowered anthropogenic stressors to mangroves in the reserve. Under the co-management approach, all the mangroves located in the Benin side of the reserve are identified as under low risk whereas 42 % of the mangrove cover are considered under low risk and 58 % under medium risk in Togo. Local perception also portrayed the reduction of mangrove degradation in the study sites following the adoption of the co-management approach in both countries. However, there are some challenges such as the financial support provision and regular community engagement which need to be addressed to achieve the sustainability of the positive impacts of the co management in the MTBR.

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Procedural safeguards for combating torture and other forms of ill-treatments in places of police custody. The case of Ethiopia

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KEYWORDS. — Prevention; Torture; Other Forms of Ill-treatment; Procedural Safeguards.

SUMMARY. — The right to be free from torture and other forms of ill-treatment is a universal and fundamental human rights recognized under international law and enshrined in a significant number of international conventions and treaties. In the context of police custody, among others, this right entails corresponding obligations upon states to take effective procedural safeguards aimed at preventing the occurrence of torture and other forms of ill-treatment. Ethiopia has ratified the United Nations Convention Against Torture and Other Cruel, Inhuman and Degrading Treatments or Punishments (UNCAT), and other major international instruments such as the International Covenant on Civil and Political Rights (ICCPR) and the African charter of human and people's rights. Moreover, the Ethiopian Constitution envisages procedural safeguards to prevent suspects from torture and ill treatments in police custody. Yet, reports by major international organizations and NGO's indicate that serious human rights violations including torture and ill treatments have persisted in police custody despite the ratification of the UNCAT and the constitutional recognition of procedural safeguards. This paper is based on the argument that serious practical challenges exist in the implementation of procedural safeguards against torture and ill-treatments. Taking three key procedural safeguards, namely: 1) communication with family and third parties, 2) access to independent medical examination, 3) access to legal counsel, we will review legal and normative literature of procedural safeguards against torture and ill treatments. Then we will explore and analyze compliance with procedural safeguard in police custody in practice. The findings and conclusion aims to provide different solutions in strengthening procedural safeguards to prevent torture and ill treatments in police custody.

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Fluid saturation in pegmatites and its effects on Nb, Ta, and Li mineralization: Insights from the phosphate-rich Buranga dike (Rwanda)

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KEYWORDS. — Igneous Petrology; Ore Geology; Raman Spectroscopy; Mineral Chemistry; Fluid Inclusions.

SUMMARY. — Pegmatites are magmatic rocks that host important resources of lithium, niobium, tantalum, and tin. In order to find those metals, which are critical to the energy and digital transitions, we need to improve our understanding of how pegmatites develop. Pegmatites represent highly differentiated silicate magmas, meaning that they form in the last moments of crystallization and are enriched in elements such as Li, B, P and H₂O. The concentration of these elements in the melt changes its physicochemical properties and affects the separation of aqueous fluids from it. However, the moment that the fluid is released from the melt and the role of this fluid in the mineralization of critical metals are highly debated.

The Buranga dike, located in western Rwanda, represents a good example of interactions between fluid saturation and mineralization. It is an evolved pegmatite, mineralized in Nb-Ta-Sn-Li and hosts more than 50 species of phosphate minerals, which help define the internal processes during crystallization.

Phosphates crystallize into three stages in Buranga: 1) magmatic, where primary minerals precipitate from a fluid-absent melt. 2) Magmatic-hydrothermal, when the aqueous fluid saturates from the melt and reacts with the magmatic minerals to precipitate secondary minerals. 3) Hydrothermal to supergene, where fluid-mineral reactions occur after complete solidification. Two mineralization events occur: Fe-Nb-Ta-rich rutile precipitates at the magmatic stage with early phosphates. Conversely, columbite-group minerals crystallize at the magmatic-hydrothermal stage in association with secondary phosphates.

This study indicates that fluids hold an important role in the late-magmatic crystallization of pegmatitic melts and associated Nb-Ta mineralization. P-rich melts remain “dry” for most of the crystallization, but the melt releases an aqueous fluid before complete solidification. The fluid is in disequilibrium with magmatic minerals and locally reacts with them. This internally remobilizes soluble elements and enables the mineralization of Nb-Ta minerals and secondary phosphate minerals.

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Cost-efficient survey designs for monitoring and evaluation of soil-transmitted helminths control programs

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KEYWORDS. — Public Health; Mathematical Modelling; Ethiopia & Belgium.

SUMMARY. — **Background:** To monitor and evaluate soil-transmitted helminths control (STH) programs, the World Health Organization (WHO) recommends screening a single stool sample from 250 children across 5 schools (50 subjects per school), deploying Kato-Katz thick smear (KK). It remains unclear whether these recommendations are sufficient to make adequate decision-making in low-intensity settings.

Methodology: We developed a generic simulation framework for STH surveys that captures varying sources of variation in egg counts (across schools, between and within individuals, and between smears for each of the 3 STH species (*Ascaris*, *Trichuris* and Hookworm) as well as the time and cost required to perform a survey. Using this framework, we determined the most cost-efficient survey designs (number of subjects, stool samples per subject and smears per stool sample) that allowed for adequate decision-making using a lot quality assurance sampling approach around the 2 % prevalence (any or moderate-to-heavy intensity (MHI) infections).

Principal Findings: The required survey design to make adequate decision-making varied across STH species. However, for all species employing duplicate KK (sampling 8 schools and 70 subjects per school) was the cost-efficient survey design around the 2 % prevalence of any intensity of infection. This survey design was single KK (sampling 25 schools and 52 children per school) for the 2 % of MHI infections.

Conclusion/significance: We confirm that KK is still valuable for STH program's endgame, though it is recommended to deploy a duplicate KK on a single stool sample to stop MDA, and to use a single KK to declare the elimination of STH as a public health problem.

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Session II – A

Suboptimal Cardiometabolic Health and Dietary Intake Exist at Worrying Levels Among Ugandans Living with HIV

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KEYWORDS. — Metabolic Profile; Dietary Assessment; Uganda; HIV and AIDS.

SUMMARY. — **Introduction:** Suboptimal diet and physical inactivity downgrade the putative benefits of Antiretroviral Therapy among People Living with HIV (PLWH). However, there is paucity of literature on dietary intake and cardiometabolic profiles of PLWH in Uganda.

Methods: A cross-sectional study among PLWH up to clinical stage 2 in Uganda was conducted. Dietary intake was assessed using a 24h recall method on 2 non-consecutive days. Fasted blood samples were analysed for Fasting Blood Glucose (FBG), total cholesterol, LDL-cholesterol (LDL-c), HDL-cholesterol (HDL-c) and triglycerides. Blood pressure and anthropometric measurements were performed following step 2 of the WHO STEPS protocol. The short International Physical Activity Questionnaire assessed participants' physical activity. Physical activity level was reported in Metabolic Equivalent of Task (MET minutes) which relates to energy expenditure. A range of ≥ 600 to < 3000 MET was considered minimally active. Individuals exceeding 3000 MET were defined as having health-enhancing-physical activity. Metabolic syndrome was defined according to the NCEP/ATP III criteria [1].

Results: A total of 253 patients completed this study. A high prevalence of low HDL-c (31.9 %), abdominal obesity (44.5 %), high BMI (51.6 %), raised FBG (45.3 %), high systolic blood pressure (31.5 %), elevated triglycerides (26.4 %) and metabolic syndrome (28 %) was found. More women were identified with metabolic syndrome (31.5 %) than men (19.2 %). Low prevalence of high LDL-c (4.7 %) and total cholesterol (9.8 %) was found. The mean daily energy intake was 2389 (± 768) kcal; 19 % of the participants had daily energy intake exceeding their average requirement. Diets had a high carbohydrate (65.8 \pm 10.4 % of the total energy intake) and fibre intake (30.1 \pm 12.7 g) with low PUFA (6.1 \pm 2.3 % of the total energy intake), fruits and vegetables (1.4 servings). High proportions were found of unmet intake for vitamin A (38.2 %), B₁ (48.8 %), B₂ (29.6 %), B₁₂ (29 %), folate (61.4 %), Ca (76 %), Zn (53.1 %) and Mg (41.7 %). Mean MET minutes was 6700 \pm 5509 and over 68 % of the participants had > 3000 MET minutes. In multivariate analysis, there was no significant association between duration of ART, years lived with HIV, energy or fibre intake with metabolic syndrome or a high BMI.

Conclusion: Our findings reveal a high prevalence of metabolic disturbances among PLWH in Uganda despite high levels of fibre intake and physical activity. Further, diets are suboptimal with low fruits and vegetable intake. These findings underpin the quest for dietary optimisation to improve both macro and micronutrient intake.

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Carved into bone: The first fossil amphibian “brain”

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KEYWORDS. — Paleontology; Paleoneurology; Tomography; Africa; Anura.

SUMMARY. — When the Cretaceous pipid frog *Pachycentrata taqueti* was first described from the site of In Becetén (Niger), its extreme ossification of its braincase and vertebrae was remarked as a unique feature among anurans. This ossification was little studied during the formal description of *Pachycentrata*, where it was characterized as pachyosteosclerosis, a unique feature among amphibians. In amniotes, pachyosteosclerosis has been linked to buoyancy controls, as they dive with air-filled lungs. As extant pipids can dive with empty lungs, the presence of pachyosteosclerosis could have a different impact on *Pachycentrata*. I here present our results on the tomography of the braincase of *Pachycentrata*, and the analysis of the resulting endocast reconstruction. This analysis revealed an exceptional preservation of brain structures and cranial nerves pathway, with the resulting endocast almost matching the brain of an extant anuran. The main brain structures were identified, from the main olfactive lobes to the cerebellum, including six pairs of cranial nerves (out of the ten known), alongside several vascular pathways. Comparisons to the brain of *Xenopus* and *Pipa* allowed me to infer auditory, visual and olfactive capabilities for *Pachycentrata*. *Pachycentrata* likely had a modified inner ear for an aquatic lifestyle, poorly functioning eyes and a great sense of smell. All these features are similar to those of the extant *Pipa*, and *Pachycentrata* likely inhabited similar environments, the bottom of dark, muddy and turbid ponds or lakes. Furthermore, the presence of pachyosteosclerosis could indicate that *Pachycentrata* was able to burrow the bottom of lakes to feed, escape predators, or survive a drought.

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Contribution à la compréhension du statut juridique du Comité International de la Croix-Rouge et du Croissant-Rouge

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MOTS-CLÉS. — Statut juridique; Organisation Internationale; Organisation Non Gouvernementale; Organisation Internationale Assimilée; Considération Internationale.

RÉSUMÉ. — Élément du Droit, le Statut juridique confère plusieurs avantages tant aux personnes privées que morales (la protection par exemple), en les soumettant également à certaines obligations qui en découlent (le paiement des impôts par exemple). Il est un élément déterminant pour orienter les actions, droits et obligations d'une structure. Aucune structure ne peut exister légalement, ni poser des actes sans un statut juridique qui lui est bien déterminé. C'est ainsi que le CICR dans son fonctionnement, est doté d'un statut juridique propre. G. Rona (2004, p. 1) en ces termes: «On parle parfois du CICR comme d'une «organisation non gouvernementale» (ONG). En fait, ce n'en est pas une, mais ce n'est pas non plus une organisation internationale ni intergouvernementale». Cette communication cherche à répondre à la question de savoir quel est le véritable statut juridique du CICR? En répondant à cette question, nous aurons contribué à la compréhension du statut juridique du CICR. Pour y parvenir, deux méthodes seront d'usage: l'exégétique ou méthode juridique et l'herméneutique. Ces méthodes seront appuyées par deux techniques: la documentation et l'observation directe. Trois points succincts seront développés lors de notre communication. Le premier fera une brève présentation du CICR, le deuxième développera une petite nuance entre les OI et les ONG. Le troisième enfin, proposera notre contribution à la compréhension du véritable statut du CICR, en introduisant un nouveau concept à savoir: «Organisation Internationale Assimilée» (OIA).

En effet, le véritable statut juridique du CICR fait l'objet de plusieurs débats. Au regard de ses origines (création), de son mode de fonctionnement et surtout de son influence sur la scène internationale (notamment dans la promotion et la protection du DIH); des avis sont divergents quant à déterminer si le CICR est une organisation internationale, une organisation non gouvernementale, ou jouit d'un statut particulier que lui confèrent ses Statuts. A l'issue des analyses théoriques et de terrain faites, cette communication contribuera à la détermination du statut juridique du CICR en le considérant comme une Organisation Internationale Assimilée (OIA). Ce nouveau concept introduit paraît au moins plus clair et caractéristique de ce qu'est réellement le CICR sur les plans juridique et opérationnel.

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To go or not to go when the lava flow is coming: Understanding of evacuation decision of Goma inhabitants during the 2021 free precursors Nyiragongo eruption crisis

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KEYWORDS. — Volcanic Risk; Push Factors; Pull Factors; Risk Mitigation; Virunga.

SUMMARY. — During a volcanic eruption generating lava flows, an effective risk reduction action is evacuation. However, if the eruption is not preceded by precursors, such as the 2021 Nyiragongo eruption (Virunga Volcanic Province), the population living near the volcano is confronted with the need to rapidly decide by themselves whether to evacuate or not; and if so, where and how. On the evening of 22 May, a red glow on the south flank of Nyiragongo alerted the population of Goma (East DRC) that an eruption had started. There were no clear instructions from the authorities. On that night, part of the population evacuated spontaneously, and returned the following day as the lava had stopped flowing. In the following week, intense seismic shocks affecting the city led the Governor to order on May 26 an evacuation of the eastern neighbourhoods.

Using a qualitative survey associated with a quantitative one among 1.137 adults residing in both mandatory and non-mandatory evacuation zones, this study analyses individual evacuation decision making during both volcano-seismic phases of the 2021 Nyiragongo eruption. The results of the statistical analyses indicate that the population in the north-eastern neighbourhoods evacuated spontaneously on the night of the eruption without prior knowledge of their destination. Their preferred destination was relatives' homes for resources, either outside the city or in another neighbourhood. The decision to evacuate was not influenced by an individual risk assessment, but by the family safety. Following the May 26 evacuation order, the majority of households evacuated while maintaining at least one person to secure the house. Fear of earthquakes was the main reason for evacuation but those who did not evacuate considered the risk to be lower, compared to the 2002 experience. The results of this study will improve the Goma contingency and evacuation plans in the event of a new volcanic eruption.

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Session II – B

Aedes Virome in Southern Cameroon

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KEYWORDS. — Viral Metagenomics; Vector Mosquito; ISV; Core Virome.

SUMMARY. — **Background:** Global health is constantly being threatened by mosquitoes as they are the most efficient vectors of major infectious agents. Mosquito genera of medical importance include *Aedes*, *Culex* and *Anopheles* which are responsible for at least 17 % of human and animal diseases (Bamou *et al.*, 2021). In Africa, the genus *Aedes* is the key vector for over 35 arboviruses and at least 25 of these have already been detected in patient's sera in Cameroon. In addition to arboviruses which can replicate in both vertebrate and invertebrate cell lines, mosquitoes also harbor Insect Specific Viruses (ISVs) which only replicate in invertebrates and are often vertically transmitted (Ohlund *et al.*, 2019). ISVs transmitted to offspring in a particular mosquito population may form a core virome (Shi *et al.*, 2020). Studies have shown that ISVs may influence the mosquito vector competence for arboviruses. However, little is known about the *Aedes* core virome in Cameroon.

Results: In the present study, metagenomic next-generation sequencing (NGS) technology was employed on 54 *Aedes* mosquito pools to determine the virome diversity and relative abundance in two major climatic zones in Southern Cameroon. NGS data revealed the presence of over 50 insect virus species from 16 viral families (*Peribunyviridae*, *Phasmaviridae*, *Phenuiviridae*, *Orthomyxoviridae*, *Rhabdoviridae*, *Ximnoviridae*, *Anelloviridae*, *Leishbunyavirida*, *Solemoviridae*, *Flaviviridae*, *Iflaviridae*, *Metaviridae*, *Totiviridae*, *Partitiviridae*, and *Reoviridae*) plus a set of unclassified viruses. A comparative analysis of the virome revealed a higher abundance and more diverse eukaryotic virome in *Aedes aegypti* compared to *Aedes albopictus* implying *Aedes aegypti* might be more susceptible to viral infection than *Aedes albopictus*. Furthermore, based on the NGS data, six virus species were selected based on their abundance for quantification. The selected viruses were most closely related to Guangzhou sobemo-like virus, Atrato sobemo like virus 4, Salarivirus Mos8CM0 (2 species), Guadeloupe mosquito quaranja-like virus 1 (2 species). Primers, probes, and standards for selected viruses were designed for qRT-PCR analyses. Results emphasize the presence of these viruses in a significant number of individual mosquitoes corroborating the NGS data, and showing some geographic differences.

Conclusion: This study shows a snapshot of the most prevalent *Aedes* mosquito (*Ae. aegypti* and *Ae. albopictus*) virome in the Southern part of Cameroon. Over 50 virus species were detected but none of these are known to be pathogenic. Viral metagenomics reveals differences in the abundance and diversity between the viromes in the *Aedes* communities. With the application of NGS, we discovered 6 potential novel eukaryotic ISVs. qRT-PCR analyses indicates that viruses selected could be part of a core virome.

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Green Building Design Strategy for a house in Phnom Penh from Life Cycle Assessment

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KEYWORDS. — Architecture; Residential Housing; Sustainable Building; Environmental Impacts; Carbon Footprint; Affordable Housing Design.

SUMMARY. — Environmentally, buildings account for 40 % of global energy use and 33 % of greenhouse gas emissions. Many researchers have introduced green technologies to minimize the environmental impact of the building sector and promote green building design. Life cycle assessment (LCA) of buildings is one of the innovative methodologies, which estimates the carbon footprint and environmental impacts generated by a building throughout its whole life cycle.

The innovation of this research is the application of LCA to a case study in Phnom Penh, Cambodia, a hot and humid tropical climate. The chosen case is a very common, most constructed and affordable typology of a townhouse. It is built with reinforced concrete frames and brick masonry walls without insulation. Moreover, LCA is used to define new strategies for green building design in South-East Asia, thanks to the modeling of different scenarios and the assessment of their local environmental impacts. Building carbon and environmental footprints have been modeled in SimaPro software using global Ecoinvent 3 databases, while respecting the standardized international LCA framework. Four scenarios have been implemented and studied on the case study: removing unnecessary materials, replacing existing materials with low carbon ones, using lightweight structure, and applying renewable energy.

The results show that the energy consumptions during the use phase generate the highest influence on the carbon footprint and environmental impacts of the studied house. All the proposed solutions contribute in reducing the global environmental footprint, but generate in some cases an increase of a specific environmental impact category. The strategy defined by combining the four studied scenarios led to about 40 % reduction in carbon footprint and 34 % decrease in overall environmental footprint compared to the existing house. The defined solutions can be used for future renovation, refurbishment, and design of new houses in Cambodia. The used methodology and types of green design solutions should be useful in all countries of South-East Asia.

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Preparing Vietnamese university students for the international labor market *Investigating Content-and-Language-Integrated Learning and Teaching*

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KEYWORDS. — Content and Language Integrated Learning (CLIL); English-medium Instruction (EMI); Language teaching in higher education; Vietnamese students' employability.

SUMMARY. — The spread of English across all aspects of life has been assisted by globalisation, internationalisation, and the rise of the Internet. Like other countries in Asia, such as Indonesia, Pakistan, and Thailand, Vietnam now aims to graduate university students who master not only their subject area but also the English language well (Galloway & Sahan, 2021). This aim has led to the adoption of new educational policies and educational reforms to improve foreign language learning across the country. Despite various policies and innovations, the quality of English language education is still in crisis (Burns, 2022; V. H. Nguyen & Hamid, 2021). Thus, since 2008 the content and language integrated learning (CLIL) project has been introduced in Vietnam through the decisions by The Ministry of Education and Training (MOET) of Vietnam, which aims to develop the youth's foreign language (FL) proficiency and their professional capacity in the future (Pham & Barnett, 2022) practitioner and student perspectives presented in previous chapters. We argue that their collective perspectives indicate closer alignment with the concept of English Medium Education (EME).

From CLIL, it is expected that it will improve science teaching in high schools and at the tertiary level. Despite the fact that one of the goals of the scheme was to improve Vietnamese students' and instructors' English proficiency, the undertaking has been beset by problems (T. B. N. Nguyen, 2019). Therefore, discovering the nature of the implementation and its effectiveness in Vietnamese universities should receive significant focus and attention.

Our study, first, focuses on Vietnamese students' experiences with CLIL education. On the basis of quantitative and qualitative data results, this study allows students to express themselves on a particular teaching context where English is rarely used outside their classroom. Three hundred thirty-five (335) undergraduates participated in the survey, and the results show that they have a favourable impression of the CLIL learning environment and different views on their professors' English abilities and teaching activities. Based on the participants' comments, the study recommends various practical teaching implications for stakeholders in the CLIL sectors. Indeed, learning practices used by students and their learning experience hold valuable lessons for CLIL stakeholders (lecturers, curriculum designers, and program managers) to improve the learning programs.

The second study aimed to explore the motivation of Vietnamese university students for their CLIL programs in a developing country where CLIL motivation has not received much attention from researchers. An anonymous online survey using Qualtrics was created to collect data between May and June of 2021, using a mixed-method methodology (Creswell, 2017). A total of 339 students (39.5 % men and 60.5 % females) participated in the study. The results demonstrate certain relationships between students' self-esteem, their self-perceived EL improvements, and their learning difficulties while participating in a CLIL program. Students' motivation to learn and improve their English proficiency as well as the expectation that they will learn in a dynamic learning environment are primary motives to enroll for the CLIL programme.

The third study was designed to explore the impact of CLIL on gender-related differences in language and content attainment. A cross-sectional study (Connelly, 2016; Martinez Agudo, 2021) using an online survey and online English Language Proficiency Tests was applied to test relationships between variables (students' EL proficiency, their self-perceived EL proficiency, and their EL anxiety or difficulties). The study also aimed to discover whether there are significant differences in groups of CLIL students based on their genders, majors, and study years (from the first to fifth year). The results show that there is no significant difference in university students' English language proficiency levels within CLIL programs regarding genders and their study years. However, the findings raise questions about the differences between women's and men's writing performances after CLIL courses and suggest future research to help educators accommodate for diversity in CLIL class-

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rooms. The study also shows that the teaching policies proposed by MOET cause universities difficulties, and challenges for both students and teachers.

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Mobilising academic, indigenous and local knowledge for inclusive agricultural development: A case study in the Upper East region of Ghana

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KEYWORDS. — Sociology of Knowledge; Knowledge Politics; Qualitative Case Study; Ghana.

SUMMARY. — In recent decades, academic recognition of indigenous-local knowledges has increased, as these knowledges are uniquely positioned to provide communities with the ability to cope with shocks in their food systems. This has led to a call for increased participation of indigenous-local actors in agricultural development processes, and the inclusion of their knowledges. Nevertheless, inclusive development can only be realized when there is sufficient recognition of diverse knowledges of stakeholders. Yet how this recognition may be enhanced without producing or maintaining epistemic injustices, is a topic for debate. This study posits that in order to gain an understanding in this, it is essential to study the diversity of perspectives on what knowledge constitutes and how the politics of knowledge shape these perspectives. This is done within the context of an empirical case in the Upper East region of Ghana. The Upper East region in Ghana is marked by a high number of development projects, especially pertaining to the creation and maintenance of dams and irrigation systems for farming. This entails that there is a significant amount of interactions between development agents from the government, local and international NGOs, farmers, and other civil society. Furthermore, it is highly diverse in terms of cultural and linguistic communities, and indigenous-local knowledges, in a relatively small geographical area compared to the rest of Ghana. The research looks at how different actors within the agricultural development arena conceptualize indigenous and local knowledges, along with their appreciation of different knowledges (academic, indigenous, farmers', ...) within the process of inclusive agricultural development. This case details diverse perspectives on agricultural innovations, their development process and whose knowledge is taken into account or deemed valuable, based on fieldwork undertaken in 2021. For this qualitative research, 32 semi-structured interviews were undertaken, alongside participant observations, informal conversations and focus groups with a diversity of stakeholders. Stakeholders included in the research were comprised of a diversity of farmers (commercial, small-scale, traditional, ...), academics, religious and spiritual leaders, traditional spokespersons, extension officers, and civil society actors. The initial findings show that more often, external actors (external to the communities in question, such as international NGOs, government extension officers, ...) place an emphasis on knowledge external to the community as being more 'innovative' and 'verified'. Furthermore, aspects of indigenous-local knowledges are included in development processes, insofar as they support that external knowledge. This showcases that there is a dominant perspective on which knowledge is accepted, shaped by traditionally powerful actors, reinforcing existing epistemic injustices. The article concludes by putting forward strategies towards mobilizing diverse knowledges in inclusive development processes.

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Keynote Lecture

State of scientific and technological research in the Democratic Republic of Congo (DRC)

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KEYWORDS. — Research; Science and Technology; Democratic Republic of Congo; University; Congolese Academy of Sciences.

SUMMARY. — Scientific and technological research in the DRC started during the colonial period, operating and flourishing in strategic sectors: agriculture, mining, geography, health and sciences.

The departure of most Belgian researchers from these institutions after independence left a void because the Congolese skills were not there. Later the Congolese government rehabilitated most of the research institutions and created others for a total of 26 currently.

However, the modest budget allocated to scientific and technological research sector does not allow adequate functioning of most research institutions, apart from those supported by international cooperation (INRB and CREN/K).

University research stimulated by doctoral research and the promotion of teachers is remarkable despite the absence of institutional support. The contribution of ARES (Belgium) has impacted positively some universities in the country.

The organic chemistry and energy laboratory under my direction carries out research on antimalarial plants, water disinfection by plant extracts, the study of biofuels from unconventional oilseeds and the use of cassava waste.

The Congolese Academy of Sciences (ACCOS), created in 2021, is called upon to play a major role in the application of science and technology to solve the problems of society.

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Session III – A

Les producteurs du charbon de bois au sein du bassin d'approvisionnement de la ville de Lubumbashi (RDC): profil socio-économique, typologie et pratiques

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MOTS-CLÉS. — Gestion durable; Charbon de bois; Enquête systématique; Lubumbashi.

RÉSUMÉ. — L'approvisionnement durable en charbon de bois des villes de la RDC pose problème. Bien d'études et projets ont été réalisés en RDC notamment à Kinshasa et Kisangani le cas du projet Makala (2009-2014), et même l'engagement du pays au processus REDD+, pour lutter contre le changement climatique. A ce jour, il est important de capitaliser les acquis de tous ces projets en vue d'un approvisionnement durable de ces villes. En ce qui concerne Lubumbashi, la demande en charbon de bois ne cesse d'augmenter suite à la croissance démographique. Son bassin d'approvisionnement l'entoure et regorge plusieurs producteurs présentant diverses caractéristiques socioéconomiques et pratiques. Cet article étudie les producteurs de charbon de bois du bassin d'approvisionnement de Lubumbashi tout en décrivant leurs profils socioéconomiques, certaines de leurs pratiques et fait leur typologie. Des enquêtes systématiques ont été réalisées auprès de 258 Chefs de ménage de 4 villages (Luisha; Maksem; Mwawa et Sela) situés dans un rayon de 80 Km autour de la ville. Les résultats ont montré que la production du charbon de bois occupe près de la moitié des chefs de ménage et constitue une activité principale pour 61,8 % des charbonniers répartis en producteurs occasionnels (41,2 %) et professionnels (58,8 %). Ces producteurs sont majoritairement des hommes (97 %) allochtones (~88 %) travaillant davantage individuellement. Mariés (92 %), avec une taille de ménage en moyenne de 8 personnes et un niveau d'étude secondaire pour la plupart. Ils sont jeunes (~42 ans), leur ancienneté est de près de 6 ans. Par ailleurs, la production du charbon de bois finance les activités agricoles pour les producteurs- agriculteurs et permet aux acteurs de s'offrir un habitat en matériaux durables. Les producteurs se professionnalisent d'avantage, étant jeunes, allochtones avec des ménages peuplés, ils développent des pratiques de production de charbon de bois se trouvant plus rentables économiquement pour eux, mais plutôt dégradantes de la forêt. Des propositions de gestion durable doivent être mises en application afin de maintenir la forêt.

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Listening to global warming: Assessment of the impact of coral bleaching and marine protection measures in Polynesia through passive acoustic monitoring

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KEYWORDS. — Soundscape; Biophony; Marine Protected Area; Resilience; French Polynesia.

SUMMARY. — Among the different disturbances affecting coral reefs, climate change is expected to become the major cause of their degradation towards this century. In coral reefs, anomalously high sea temperatures are linked to coral bleaching events. Mass bleaching events alter the ecological process of coral reefs while marine protected areas (MPAs) can increase the resilience of coral reef communities to natural disturbances, playing a role in sheltering biodiversity from climate-related impacts and in the recovery of corals from massive bleaching events. In Moorea Island (French Polynesia), two bleaching events occurred between 2015 and 2021. The aims of this study are to compare the soundscape of the external slope of Moorea Island within and outside MPAs in 2021 to assess the presence or the absence of a protection effect on acoustic data and to compare them to data sampled in 2015 to assess both temporal and protection effects, in relation with the benthic cover and the fish species present. MPAs have a greater fish species richness and coral cover than surrounding areas (contrary to what was observed in 2015, showing a possible reserve effect) while their low-frequency power spectral density was lower. Between 2015 and 2021, coral cover decreased by 10 %. When comparing 2015 and 2021 soundscapes, nocturnal high-frequency biophony were louder on the sites from the east coast, *i.e.* the only sites with an increase of coral cover between 2015 and 2021. This link between high power spectral density values and coral cover between 2015 and 2021 confirm the efficacy of passive acoustic for long term monitoring.

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“Modernist Protestantism” versus “Chinese Superstition”: Sun Yat-sen’s Christian Revolutionary Quest

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KEYWORDS. — Modernism; Religious Theory; Comparative Philosophy; Late Qing-Republican Transition; Greater China.

SUMMARY. — Sun Yat-sen (1866-1925), who became the first provisional president of the Republic of China in 1912, spend most of his formative years in what Marie-Claire Bergère (1998, 20-23) coined “coastal Blue China” – a dichotomic concept standing in opposition to “continental Yellow China”. Bergère’s Blue China consisted of overseas areas with Chinese communities under Western control/influence, as well as the treaty ports in (mainland) China where Western forces enjoyed considerable privileges after the advent of the Unequal Treaties. Around the turn of the 20th century, the increasingly modernist teachings of Protestant missionaries in Blue China aligned well with the revolutionary aims of Sun and his followers, allowing for a “window of opportunity” with considerable cooperation taking place. This contribution further expands upon Bergère’s concept of Blue China by linking Sun and his revolutionary movement to the influence of Protestant Modernism in Blue China – instead of an often generalized “Western learning” or “Christianity” in (all of) “China.” The sequential focus is put on the first part of the aforementioned “temporal window” when the goals of the Chinese revolutionaries prominently aligned with those of the Protestant missionaries, *i.e.*, from just before the turn of the 20th century until Sun’s short tenure in office in 1912. To emphasize the point that Protestant Modernism – specifically – has been understated as a formative influence on the Republic of China, a ‘zoomed-in’ case study of the influence of the religion on Sun in making him aspire to change China is provided through an overview of his educational background and occasional replication of religious credo.

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Climate change impacts estimation on the long-term mean annual streamflow of the São Francisco River Basin, Brazil

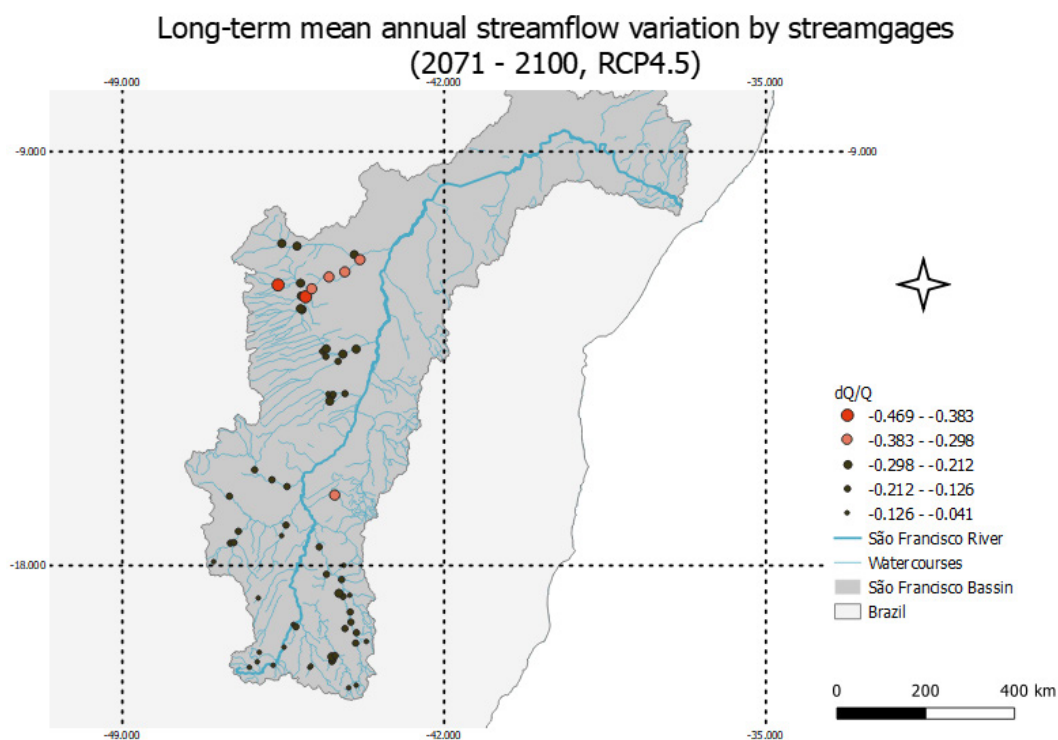
Fabrizio T. A. SIMÕES^{1,*}

KEYWORDS. — Streamflow Trends; Budyko's Framework; Water Energy Balance; Climate-elasticity.

SUMMARY. — The understanding of the impacts caused by climate change on water availability is extremely important for implementing efficient water resource management and planning. This way, in order to understand the relationship between climate and water availability, this work addresses how the flow of the São Francisco River in Brazil, will vary according to two scenarios of RCP (4.5 and 8.5).

Using eighteen global climate models (GCMs) it was possible to estimate the variations in precipitation and potential evapotranspiration of the São Francisco River for three distinct time horizons (2015-2040, 2041-2070, 2071-2100). With a theoretical approach based on Budyko's hypothesis and the concept of climate-elasticity, it was possible to estimate the variations of the long-term average flows in the basin for the same time horizons. The methodology was applied to 64 streamgages with at least 30 years of consecutive record and with no reservoir influence.

The sensitivity analysis showed that a 5 % increase in precipitation will result in a 11.6 % increase in runoff, whereas a 5 % increase in potential evapotranspiration will result in a 6.6 % decrease in runoff, with variations in flow more pronounced in sub-basins with arid characteristics. Concerning the average streamflow, the global trend for the entire set is that long-term average flows will present a negative variation which can reach up to 47 % of the present average flow (fig. 1).



Although some GCMs predict an increase in long-term average flows for some streamgages, it was concluded that the more arid regions will suffer a greater negative effect of climate change on the variation of precipitation, potential evapotranspiration and flow. Further studies are strongly recommended, specially by varying the selection criteria of the fluviometric stations to map the variation of dQ/Q throughout the hydrographic basin, aiming at the understanding of a spatial dependence for these values.

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Current and future outdoor thermal comfort in Asia

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KEYWORDS. — Climatology; Biometeorology; Universal Thermal Climate Index; Heat Stress; Asia.

SUMMARY. — Ongoing global warming causes increasingly frequent extreme weather events, such as heat waves, which will only intensify over time. This will impact our future perceived thermal conditions, but to which extent? Our perceived thermal comfort is not only depending on air temperature but also on wind speed/ventilation, humidity, solar and thermal radiation. Next to these meteorological variables there are also personal factors that play a role, *i.e.* activity, clothing insulation, age, weight, adaptation to the prevailing climate and psychological factors. By keeping these personal factors constant over time, the change in outdoor thermal comfort under the 1.5° C, 2° C and 3° C global warming scenarios has been studied to investigate how the changing climate will affect the outdoor living conditions in Asia.

Hourly data of the regional climate model ALARO-0 was used to compute the current and future Universal Thermal Climate Index (UTCI) to express the outdoor thermal comfort conditions of 40 Asian locations. Currently, citizens of New Delhi, Abu Dhabi and Doha already experience warm conditions (UTCI > 23° C) more than 50 % of the time when outdoors and outdoor locations near Doha and Kuwait City undergo extreme heat stress (UTCI > 41° C) 9 % of the time. However, the largest future outdoor thermal comfort changes were found for the high latitude locations *e.g.* Novy Urengoy (Russia) with a remarkable reduction in cold stress. For all locations it was found that higher global warming leads towards larger changes in outdoor thermal comfort conditions.

Due to the shift towards warmer conditions for all 40 locations, human health heat thresholds will be exceeded more frequently, leading to reduced wellbeing. To overcome the increase of deadly heat stress, the emission of greenhouse gasses should be reduced and adaptation strategies such as green infrastructure and warning systems should be developed and implemented.

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Effects of landscape heterogeneity on bird diversity in farmland at multiple spatial scales

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KEYWORDS. — Landscape Ecology; Moving Window Method; Qihe County in China.

SUMMARY. — A farmland biodiversity strategy is needed for China. In a simulation study of a distribution model of 1111 bird species, Li *et al.* (2020) found that farmland is a suitable habitat for 220 of them. What kind of landscape heterogeneity can sustain higher bird diversity in farmland? In the first part of this study, the selection of landscape sites with a gradient of landscape heterogeneity based on spatial analysis has been completed in Qihe county in China, according to the method employed in Canada by Pasher *et al.* (2013). The traditional approach is to select sample plots at random. We obtained heterogeneity values for multiple extents at all possible landscapes in the portion of the study region that had 60-90 % farmland, with every pixel being the potential centre of a landscape based on a land cover map according to the moving window method. The maximum extent for analyses is determined to be 1 km, based on the variation coefficient of landscape variables. The minimum distance between sites is determined to be 2.5 km, based on Moran's index to avoid spatial autocorrelation. Twenty landscape sites for birdwatching were selected to meet all the conditions. Within each landscape, we chose four sites at field boundaries between two crop fields, such that sites were at least 200 m apart, at least 50 m from non-crop areas (*e.g.* forests, wetlands, abandoned fields, farmsteads, roads), and at least 50 m from the edge (in the same way as was used by Fahrig *et al.*, 2015, in Canada). Birds were at first surveyed using 10-min point counts. Later, one transect line in the center of each site was selected for bird survey. The data, obtained in 2022, showed that bird diversity was affected by both composition and configuration of the landscape, but the results varied according to the two methods of bird survey.

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Session III – B

Multiple mineralization and fluid flow phases in the Central African Copperbelt

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KEYWORDS. — Geology; Age-dating; Geochemistry; Katanga Copperbelt; DRC.

SUMMARY. — Cobalt (Co) and copper (Cu) are both strategic elements of crucial importance for the European and world economy. This project focuses on the sediment-hosted copper and cobalt deposits in the DRC, in the region known as the Katanga Copperbelt.

Numerous models have been proposed for the ore-forming processes in the Copperbelt, ranging from a magmatic to syn-sedimentary, diagenetic, and orogenic origin or a multiphase origin (Cailteux *et al.*, 2005; Selley *et al.*, 2005). In the latter model, two main hypogene mineralization phases are proposed (El Desouky *et al.*, 2010): the first occurred during diagenesis of the Neoproterozoic strata and the second near maximum burial and deformation (orogenesis) of the sediments. Each of these phases shows different ranges in salinity and temperature of the hydrothermal fluid that caused ore-formation.

The Re-Os and U-Pb isotopic systems have been successfully applied to date mineralizing processes in the Copperbelt. However, a common problem is the wide range of ages, which are sometimes geologically unrealistic, obtained in the analysis and dating of these systems. These inconsistencies can be explained by a mixing of different generations of ore, the remobilization and recrystallization of the ore and gangue minerals, and (partly) also by the isotopic resetting of the ages. Although most studies are based on detailed petrography, some are not supported by careful cathodoluminescence petrography and geochemical mapping allowing to identify geochemical variations within and between the analyzed minerals, which is the aim of this project. Such cathodoluminescence petrography and mapping allow the identification of different mineral generations and recrystallization episodes that may be crucial to understand the ore-forming processes and unravel apparent age inconsistencies.

By distinguishing the different stages and age-dating of the carbonate generations associated with both barren and mineralized phases, it is possible to define the evolution and geochemistry of the fluids present during the mineralization, to identify different fluid flow events and link them with the geodynamic evolution of the basin.

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The ecology of animal personality and the effect on viral infection risk in natural populations of *Mastomys natalensis*.

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KEYWORDS. — Disease Ecology; Multimammate Mouse; Co-infection; Personality; Tanzania.

SUMMARY. — Emerging infectious diseases are a significant challenge for global public health. Understanding the transmission dynamics of such pathogens is crucial to reduce and control potential outbreaks. The rate at which an infection spreads within a population depends on the transmission coefficient, which can vary among individuals within a single population. The underlying mechanisms need to be studied more closely and could affect epidemiological models. One of these mechanisms is potentially the host's personality.

Animal personality, or consistent individual variation in behaviour among individuals over time and/or context, has indeed been found to affect parasitic infection risk. Most studies, however, focused on macro- and ectoparasites, while relatively little attention has been paid to viruses. Nonetheless, such information is potentially crucial to increase our understanding of the disease dynamics of pathogens in wildlife, especially for those with zoonotic potentials.

We focused on animal personality in the multimammate mice (*Mastomys natalensis*), how variation in these traits is maintained over generations and how they influence viral infection risk. We had three main questions that we wanted to address in this study: (i) Can we measure animal personality in *M. natalensis*? (ii) Is there a link between personality and Morogoro virus (MORV) infection risk? (iii) Which factors are responsible for maintaining the variation in personalities?

In short, (i) we were able to measure two personality traits: stress-sensitivity and exploration behaviour. (ii) Only the latter affected MORV infection risk, where less explorative individuals were more likely to be infected with MORV, potentially due to underlying co-infection patterns with other parasites, such as different helminth species and bacteria. (iii) Density played a significant role in maintaining the variation of these two personality traits. This study shows that animal personality in *M. natalensis* exists, is maintained by variation in density and that they influence the disease dynamics of MORV.

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Drawings along the Nile: Documenting the endangered rock art from West Bank Aswan

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KEYWORDS. — Egyptology; Rock Art; Archaeology; Survey; Aswan.

SUMMARY. — The Aswan-Kom Combo Archaeological Project (AKAP) operates in a large archaeological concession encompassing the Nile Valley and the desert hinterlands of the Aswan-Kom Ombo region (southern Egypt) since 2005. Among AKAP's varied archaeological endeavours, much attention has been directed to studying the numerous rock art tableaux scattered across the whole concession. In that context, the Egyptian Ministry of Antiquities urges AKAP to complete the documentation, processing, and publication of the inscribed and engraved material located in the area where the New Aswan City is currently being built. Most of these rock art sites remain to be properly recorded before their probable destruction. This paper aims to present the result of a short salvage mission that the author will conduct in the Sheikh Mohamed District (Aswan West Bank), at the heart of this area highly endangered by modern urbanism, in November 2022. This mission ambitions to process all the previously recorded panels and to document those that are still unknown to scholars. Because some of the panels are partly or completely covered with sand, limited archaeological investigations are also required. The possibility of conducting OSL analysis of this covering, a technique already used with success in Egypt, might allow dating these engravings. Without such urgent salvage work, these rock art sites will be irrevocably damaged, forever condemning them in terms of tourism, heritage, and scholarly potential.

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Undoing the development army: A paradigm shift from Transfer of Technology to Agricultural Innovation System in Ethiopian extension

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KEYWORDS. — Policy; Agricultural Extension; Top-down; Bottom-up; Deductive Approach.

SUMMARY — Appropriate use of agricultural technologies and diversifying the farming activities are critical to addressing food security problems in Africa South of the Sahara, including Ethiopia. The country is experimenting with the new Agricultural Innovation System (AIS) approach alongside the well-established Transfer of Technology (ToT) approach. This paper analyzes the gaps between policy discourses (as reflected in policy documents and strategic orientation documents) and extension practices (as reflected in the daily exchanges between farmers and the frontline staff of the Ethiopian extension system). A qualitative research approach was deployed for the analysis of both policy discourse and practice. The data for the paper came from 23 Focus Group Discussions conducted with men and women. Thirteen Key Informant Interviews (KIIs) were also carried out with personnel at different levels of government agricultural services and departments. Transcripts of recordings of the FGDs and KIIs were analyzed using a deductive approach. The findings demonstrate that, although the policy documents strongly adhere to AIS principles, top-down ToT approaches continue to dominate in practice. Practically, prescriptive systems are still used because AIS approaches are not well understood by the Extension Agents. In order to realize a genuine AIS, Ethiopia's extension apparatus should move forward with building committed and robust relationships between innovation actors. To this end, more research, improved training, and improved institutions are needed on what genuine AIS could look like at the grass-root level, which roles different actors within Ethiopia's development army should take on, and how a multi-actor policy dialogue can be organized.

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***Campylobacter* species occurrences in Ethiopian animals and diseased children: A One-Health approach**

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KEYWORDS. — Microbiology; Campylobacteriosis; Ethiopia; Cultivation; MALDI-TOF MS.

SUMMARY. — *Campylobacter* is a zoonotic Gram-negative bacterium gender able to colonize a variety of hosts. Childhood campylobacteriosis is strongly linked to severe morbidity, stunted growth, cognitive impairment, and death. In rural areas of Ethiopia, farm animals are regularly kept indoors. At that level, the co-occurrence of *Campylobacter* species infections in children, farm animals and pets has not been adequately addressed. Therefore, this study examined the presence of *Campylobacter* species in a large cohort of children and domestic animals in Ethiopia.

Via health centers, stool samples from 303 children with diarrhoea were obtained upon informed consent of the parents while visiting their homes; meanwhile 705 animal fecal samples were collected. Campylobacters were isolated in the Ethiopian lab using filtration on 0.6 µm pore size polycarbonate filters on modified Charcoal Cefoperazone Deoxycholate agar (mCCDA) plates and microaerobic incubation at 37°C. Typical isolates were subcultured on blood agar and shipped from Bahir Dar, Ethiopia to LM-UGent, Belgium for identification with MALDI-TOF MS.

Out of the 1008 samples, *Campylobacter* was presumptive present in 240 (23.8 %) samples, with 22 % in the stool of children (n=68), 43 %, 9 %, 6 %, 5 %, 4.5 %, and 2.5 % in sampled chickens (n=107), cattle (n=21), sheep (n=15), dog (n=12), calf (n=11) and goat (n=6), respectively. Further analysis by MALDI-TOF MS confirmed 55 % (n=132) of the 240 presumptive isolates. Four isolates were identified as *Arcobacter* spp. *Campylobacter* was confirmed in 37 children (12 %) and 91 animal samples (13 %). Of the 128 samples in which *Campylobacter* was present, identification to species level was possible, with assignments to *C. jejuni* (81 %), *C. coli* (11 %), *C. fetus* (2 %) and a combination of *C. jejuni* with *C. coli* (4 %). Co-occurrence of a child and animal infection was observed in 8 households.

The high prevalence of *Campylobacter* in children with diarrhoea and animals, along with observed clusters in eight households point the need for further characterization of these isolates to assess potential environmental sources and transmission routes of infection for children.

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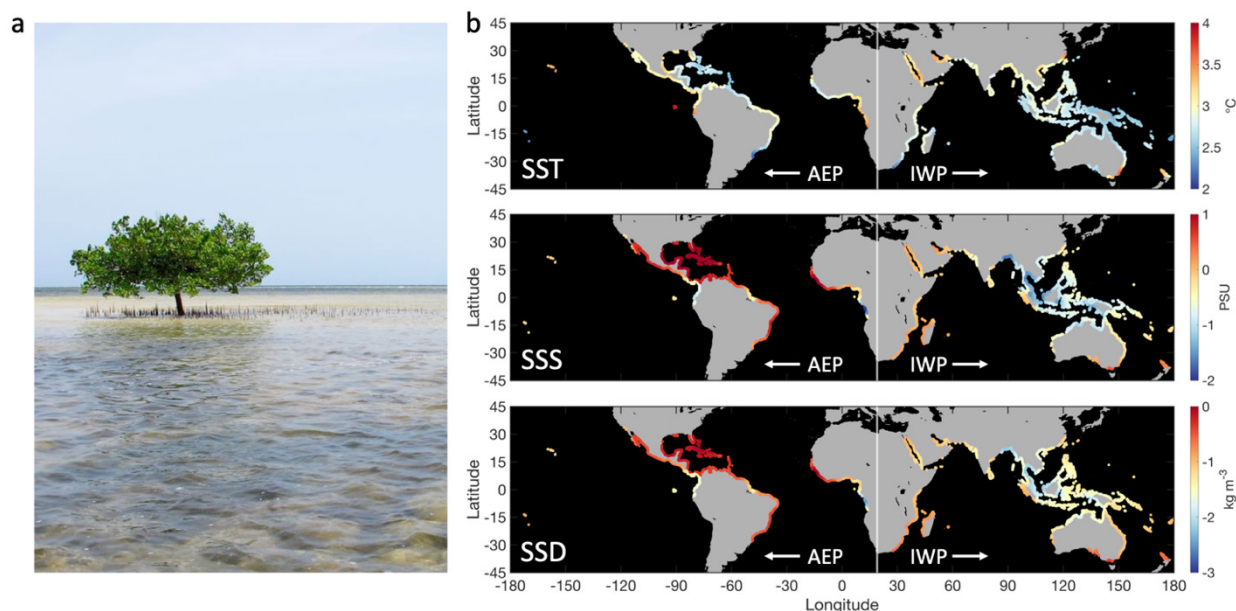
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Mangrove dispersal disrupted by projected changes in global seawater density

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KEYWORDS. — Climate-Change Ecology; Tropical Ecosystems; Dispersal; Oceanography.

SUMMARY. — The degree to which the distribution of mangrove forests will be impacted by climate change depends on the dispersal and establishment of sea-faring propagules, which drive forest rejuvenation, gene flow and range expansion. Climate change affects sea surface density via changes in temperature and salinity. However, these changes have not been mapped and it remains unclear how these factors may impact mangrove propagule dispersal. Here, we provide evidence for strong warming of coastal mangrove waters and elevated geographic variability in surface ocean density under representative concentration pathway RCP 8.5 by 2100. The largest changes will occur in the Indo West Pacific region, the primary hotspot of mangrove diversity. By comparing propagule densities to predicted sea surface density, we assessed potential effects on mangrove propagule dispersal. In the future, a warmer and fresher ocean is likely to alter dispersal trajectories of mangrove propagules and increase rates of sinking in unsuitable offshore locations, potentially reducing the resilience of mangrove forests.



Projected climate-induced changes in the properties of the sea surface are likely to impact dispersal patterns in wide-ranging mangrove species. a, Mangrove forests thrive at the interface of land and sea and are exposed directly to ocean changes (photograph by Tom Van der Stocken, Gazi Bay, Kenya). b, Global maps of changes in sea surface temperature (SST), sea surface salinity (SSS) and sea surface density (SSD) in mangrove waters globally, between the present (2000–2014) and future (2090–2100). The future properties were modelled using the high carbon emissions representative concentrations pathway (RCP8.5). The vertical line (19° E) separates the two major mangrove bioregions: the Atlantic East Pacific (AEP) and Indo West Pacific (IWP) (© 2022, Van der Stocken, T. *et al.*, CC BY 4.0).

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Posters

Identifying hotspots of soil erosion and proposing targeted catchment restoration using an evidence-based approach in Lake Tana Basin, Ethiopia

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KEYWORDS. — Radionuclides; eDNA; Sediment Fingerprinting; SWAT Model.

SUMMARY. — Identifying the origin of sediment is very crucial for proposing mitigation strategies and guiding the implementation of effective catchment restoration measures. Sediment source fingerprinting is a novel and powerful method to identify hotspots of soil erosion in catchments. It has been increasingly used in the past few decades, albeit with little applications in Africa and has not been used in Ethiopia for soil erosion research so far. Thus, the aim of this study will be to identify hotspots of soil erosion and to propose targeted catchment restoration using evidence-based approach in Lake Tana Basin, Ethiopia. The source of sediment will be identified using radionuclide tracers, environmental DNA (eDNA), soil erosion modelling and connectivity analysis. Soil samples will be collected from top soils and subsoils in order to determine source signals for radionuclide analysis. Additionally, samples of sediment will be collected in Gumara River and its tributaries for over a period of three years. Similarly, for eDNA analysis, soil, sediment and plants leaves samples will be collected in the catchment. Land use/cover, topography, climate and soil data will be prepared/collected for modelling and connectivity analysis. Soil, sediment and plant species samples will be analysed in order to characterize the source signatures, following standard protocols for eDNA using UGent facilities and at LSCE, Univ. Paris-Saclay, for radionuclides. Soil erosion modelling will be done using Soil & Water Assessment Tool (SWAT) model. The model will be validated using measured sediment data. For eDNA results the dominant mixtures will be derived from scatterplots of eDNA reads above a defined threshold. Quantitative source apportions for surface versus subsurface erosion; mainly gullies will be done using appropriate models. Once the sources of sediment will be identified, we will analyse which effective restoration activities can be undertaken based on available knowledge on plant hydro-mechanical effects on slope stability.

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Agroecology, Power and the Project for a New Social Fabric in Argentina

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KEYWORDS. — Rural Sociology; Ethnography; Argentina.

SUMMARY. — Agroecology is a word that in itself is the object of a lot of contention. Academics, peasant movements, agronomists and countless others have used different approaches in conceptualizing agroecology and innumerable definitions have been rendered. It is thus not the objective of this paper to offer yet another definition of agroecology, but rather to examine one conceptualization which is rather prevalent in academia. Agroecology is in many cases perceived as consisting of science, movement and practice; these three categories are no separate entities, but rather continuously interacting spheres which lay the foundation for agroecology in its aspiration to cause paradigmatic change (as it is often called). As Wezel *et al.* (2009) point out, these three aspects of agroecology developed in different stages and to differing degrees, strongly dependent on socio-political and institutional differences between countries and regions. This paper is based on ethnographic fieldwork in Argentina between February and September of 2022 with farmers and representatives from social movements, government representatives and academia. It uses participant observation, semi-structured interviews and discourse analysis in order to interrogate the aforementioned conceptualization of agroecology and elaborate on it. Based on our research in Argentina, it is our contention that agroecology as an inherently feminist, decolonial and anti-capitalist concept should be understood as part of a larger network of power relations and more importantly, as a form of resistance to the effects of expanding frontiers of accumulation and coercive institutions in peasant territories. This resistance not only exists in peasant territories, but is characteristic to various disputed spaces, of which the university forms part as well. In our experience, a more holistic approach to agroecology involves deconstructing preconceived categories such as science, practice or movement. If one assumes that one of the main objectives of agroecology is to dismantle and deconstruct coercive institutions and challenge prevailing relations of power, it then follows that the arbitrary distinction between science, movement and practice only makes sense in the construction and imaginary of agroecology within the current structural limitations that exist and that the intended consequence of the agroecological movement is the creation of the societal parameters that allow for this distinction to become obsolete. Questioning what science, practice and movement mean in the context of agroecology and challenging the premises behind these categories is the object of this study.

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Évolution du processus de ravinement dans le bassin versant urbain de la Kimemi (Butembo/RD Congo)

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MOTS-CLÉS. — Erosion; Expansion du ravinement; Urbanisation; Bassin versant; Butembo.

RÉSUMÉ. — Le ravinement est l'un des mécanismes de dégradation des paysages le plus intense dans des zones avec des caractéristiques environnementales variées. Ce phénomène induit des dégâts environnementaux et socio-économiques. Divers facteurs tant physiques qu'anthropiques influencent le processus de ravinement. Ce travail analyse la dynamique (2011 à 2021) de la morphologie du réseau de ravinement dans différentes classes d'occupation de sol et les facteurs d'occurrence de ce phénomène. L'étude a été réalisée dans le petit bassin versant de la Kimemi (64,5 km²) situé dans la ville de Butembo (Nord-Kivu/RD Congo). Les données ont été obtenues lors de travaux de terrain et de la digitalisation sur les images *Google Earth* de 2011, 2015 et 2021. Les valeurs de longueur et largeur, de même que la superficie des grands ravins (largeur ≥ 5 m) mesurées pour les différentes années ont été soumises au test non paramétrique de Kruskal Wallis pour évaluer les différences entre les années. Un modèle de régression logistique a permis également d'étudier l'influence de sept facteurs (pente, *Stream power Index*, densité de drainage, Occupation du sol et utilisation de sol, NDVI, distance par rapport à la route et le cours d'eau) sur l'occurrence de ravinement. Un ensemble de 30, 53 et 60 ravines avec des longueurs moyennes de $61,1 \pm 63,9$ m, $129,3 \pm 104,9$ m et $174,7 \pm 153,8$ m ont été cartographiés respectivement pour les années 2011, 2015 et 2021. La densité moyenne pendant cette période d'étude est de 0,12 km/km². La superficie de terrains endommagés est de $\sim 1,3$ ha/an (2011-2015) et $\sim 1,1$ ha/an (2015-2021) pour l'ensemble du bassin versant. Le test de Kruskal Wallis indique que les variations de tous les paramètres morphologiques sont significatives entre les années d'étude uniquement dans la classe des sols nus et bâtis. Par ailleurs, l'occurrence de ravinement est influencée significativement par tous les facteurs retenus sauf la densité de drainage. Les zones proches des routes et des cours d'eau sont plus susceptibles d'être raviniées. Les zones à faible pente ($\leq 10^\circ$) sont également plus vulnérables au ravinement à cause de l'eau de ruissellement qui s'y concentre. En plus, le phénomène de ravinement est plus susceptible d'apparaître dans la classe de sols nus et bâtis par rapport à d'autres classes d'occupation du sol. Cette situation montre une influence assez importante des actions anthropiques liée à l'élimination de la végétation sur l'évolution et l'occurrence de ravinement dans le bassin versant de la Kimemi. Les décideurs peuvent tenir compte de ces résultats dans l'aménagement du territoire.

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The world of the Mayans revealed by lidar and satellites

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KEYWORDS. — Remote Sensing; Archaeology; Pléiades; Data-fusion; Yucatan.

SUMMARY. — Light detection and ranging (lidar) technology allows archaeologists to map objects and structures that might otherwise remain hidden under dense forest canopies. The Yucatan Maya area is becoming the centre of attraction for lidar applications used for archaeological prospection, particularly in densely forested areas. Unfortunately, this innovative technology often fails to reach the user community: the archaeologists themselves. This is a challenge as the expertise and knowledge to process lidar data and other remote sensing data are often lacking among these stakeholders.

Against this background, our poster presents the combination of lidar point clouds and Pléiades satellite images to visualize vestiges in Kiuic in Yucatan (Mexico) with and without vegetation cover. This provides a pseudo-3D visualization which helps archaeologists to better understand and interpret the landscape. Geodata-fusion can be extremely useful, but technical barriers to its uptake by nonexperts in earth observation have to be recognized. The necessary knowledge and skills need to be developed for processing the data. With this in mind, we developed a technical assistance manual to describe the entire technical workflow. This manual can be used as a starting point for geo-archaeology.

As the tropical dry forest canopy and the relatively inaccessible terrain of the Maya lowlands on the Yucatan peninsula complicates the use of traditional survey methods, including optical remote sensing, lidar can offer a solution. It has already proven to be useful for site survey, interpretation, and discovery, but combined with high-resolution Pléiades images, archaeologists are able to generate more realistic 3D models. We encourage collaboration among archaeologists and other scientific fields to continue data-fusion research as it is of great scientific value and can help solve various questions, not only in archaeology.

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Sustainable Farming Practices among Rural Arable Crop Farmers in Central Nigeria

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KEYWORDS. — Farming; Survey Data; Rural Nigeria.

SUMMARY. — Sustainable management of lands is inevitable for posterity, most importantly in agriculture as rural livelihood anchors on land. Hence, sustainable farming has a great potential for benefiting the environment and preserving natural resources. This study examined sustainable farming practices among rural arable crop farmers in central Nigeria. A multi-stage sampling procedure was used to obtain 120 respondents who were interviewed to generate the required data. The data were analyzed using both descriptive and inferential statistics. Results revealed that nearly half (43.5 %) of the respondents fall within the age range of 15-30 years, majority (88.3 %) of whom were males and married (75 %) with a minimum of secondary education (41.7 %). More than half (58.3 %) of them acquired their farmlands through inheritance, and 41.6 % had 3-15 years of farming experience through which they earn ₦50,000 to ₦900,000 (51.4 %) per season. A majority (74.2 %) had 1-15 household members and 44.9 % had 0.2 to 1.0 hectares of farmland. The major sources of information on sustainable farming practices were either relatives (98.4 %) or friends (85 %). Use of organic manure (93.3 %), crop rotation (92.5 %), cover crops (90.8 %), mulching, ground cover and manual weed control (84.2 %), and integrated pest management (71.7 %) were the most performed sustainable farming practices by the respondents. The mostly observed benefits of sustainable farming practices by the respondents included reduced water run-off (88.3 %), nutrients recycling (81.7 %) and increased income (60.0 %). Poor extension services (90.0 %), limited access to improved varieties (55.8 %) and small farm size were the major constraints to sustainable farming practices. The respondents' income ($r = 0.262$), household size ($r = 0.213$), and farm size ($r = 0.268$) were found to be significantly correlated with sustainable farming practices. Rural central Nigeria arable farmers engage and benefit from sustainable farming practices, but need to be kept abreast of improved sustainable practices through enhanced extension systems.

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The Five Viscera Paradigm in Edo Period Japan

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KEYWORDS. — Japanese Cultural History; Japanese Medical History; Esoteric Buddhism; Five Viscera and Six Entrails; Premodern East-Asia.

SUMMARY. — This presentation will focus on a scroll kept at the International Research Center for Japanese Studies (Nichibunken) in Kyoto. A late Edo period (1603-1868) handwritten production without title; this richly illustrated document contains concepts and discourses from different historically significant traditions. Its central component is the ancient Chinese theory of the five viscera and six entrails (*gozō roppu* 五臟六腑), which was a widespread conceptualisation of the internal body in premodern East-Asia, and which still survives in Traditional Chinese Medicine (TCM) today. Other traditions include esoteric Buddhism (s) of different schools, kami worship (*shintō* 神道), and “eight trigram” (*hakke* 八卦) divination. Despite the foreign origin of many of its components, the scroll takes a Japan-centric approach, by highlighting original developments and inserting Japanese concepts into historically adopted foreign frameworks.

Through philological work, the contents, origins and purposes of this scroll will be investigated. In addition to the scroll, more Edo period documents containing a similar hybrid discourse exist. Who could have made such documents? For what reasons? One hypothesis is that they were collections of old ideas in an antiquarian effort for preservation. However, long lists of medical treatments in two sources seem to suggest that they could have been used as medical manuals instead. The scroll itself contains practical medical knowledge as well, such as a mnemonic verse for remembering the location of the internal organs.

These documents can provide new insights into Edo period society. Despite the seemingly medieval nature of their components, they were produced during the Edo period. This period is typically identified with the “early modern” and associated with a more secular medicine. However, it is possible that these older discourses played a more significant role than initially expected, allowing for an alternative view on the Edo period.

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L'importance du genre dans la gestion des risques et des catastrophes

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MOTS-CLÉS. — Vulnérabilité; Inégalité; Inclusion; Renforcement; Durabilité.

RÉSUMÉ. — Au cours de ces vingt dernières années, nombreuses sont les catastrophes naturelles qui ont affectées les communautés partout dans le monde ; une situation plus aggravante pour les pays du Sud, ayant un niveau de développement humain faible. De nombreuses études prouvent que ces catastrophes contribuent fortement aux inégalités entre les genres; pourtant le travail considérable des femmes constitue, dans nos sociétés, un véritable levier du fonctionnement des communautés fortes car elles sont présentes dans toutes les étapes de gestion des catastrophes naturelles. Les limites imposées aux femmes des pays en développement, considérées comme des êtres vulnérables, rendent ces situations de crise encore plus difficiles à vivre pour elles. L'apport des femmes dans la construction des communautés résilientes face aux risques et aux catastrophes n'est pas reconnu et évalué à sa juste valeur car elles ne sont vues que comme des collaboratrices de l'homme «Chef de la famille» en raison du plus grand degré de marginalisation et de subordination au sein de la famille qui résulte d'attitudes patriarcales et de valeurs culturelles.

Les femmes sont en général responsables du bien-être de la famille en fonction des rôles qu'elles jouent pour permettre un environnement sain et productif, l'une des conditions indispensables au succès du développement durable. Leur sensibilité face à la dégradation de l'environnement et leur rôle dans les ménages les rendent plus actives dans la gestion des catastrophes que les hommes, dès lors elles représentent les principales cibles à ne pas occulter dans les solutions de réponse aux crises. Il faut donc réfléchir à la manière dont chaque citoyen, qu'importe le genre, peut contribuer à la résilience et à l'élaboration de mesures pour la réduction des risques et des catastrophes. Un nouveau travail de recherche nous amène à investiguer à travers une enquête l'importance de l'inclusion du genre dans les programmes de gestion des risques et des catastrophes des pays du Sud ainsi que la nécessité de tenir compte de l'aspect sexospécifique dans toutes les actions de réponse. Nous nous proposons de répondre aux questions suivantes: 1) Quels sont les rôles que jouent et que peuvent jouer la femme dans la gestion des risques et des catastrophes? 2) Quels moyens d'accompagnement nécessitent-elles pour une implication efficace dans les actions de réponses? La réponse à ces questions permettra de ne plus voir les femmes des pays en développement comme des personnes vulnérables mais de les considérer comme des acteurs déterminants de la réduction des risques dans une perspective de développement durable.

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Root development of Bok choy under the Sandwich compost substrate amendment

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KEYWORDS. — Bokashi; Bok Choy; Leachate; Food Waste; Soil Dehydrogenase Activity.

SUMMARY. — The soil available phosphorus (P) and dehydrogenase activity affected the root development and eventually the plant yield. Meanwhile, the food waste issues have been seriously impacting the environmental health. Hence, the food waste could be digested using the Sandwich compost. The latter has high P contents and appears to be highly versatile with the recipes. This study intended to determine the root morphology and the available P during four cycles of Bok choy growing on the Sandwich compost amendment.

A complete randomization design with destructive sampling was carried out. The evaluated amendments are listed as follows: T000: soil only (negative control), T001: soil + Sandwich compost leachate as a liquid fertilizer, T009: soil + commercial fertilizer (positive control), T010: soil + Sandwich compost leachate as a seed priming agent, T100: soil + Sandwich compost substrate, T101: soil + Sandwich compost substrate + Sandwich compost leachate as a liquid fertilizer, T110: soil + Sandwich compost substrate + Sandwich compost leachate as a seed priming agent and T111: soil + Sandwich compost substrate + Sandwich compost leachate as a seed priming agent + Sandwich compost leachate as a liquid fertilizer. The treatments were executed during four cycles and the samples seemed destructive. The measurements included the available P, root length, root projection area, root surface area, root volume, root area dimension, root length per volume, root dry matter and the dehydrogenase activity. The soil available P and dehydrogenase activity in the Sandwich compost substrate amendment increased significantly as compared to the unamended and pre-amended ones. The root length, root projection area, root surface area and root volume seemed rather low in the Sandwich compost substrate amendment, yet they have risen from cycle to cycle. The root length per volume was substantially higher during the first growing cycle. The Sandwich compost provided a large P-fixing capacity so as to achieve a biologically mediated organic P mineralization in the soil and thus the plant could use P efficiently. The enhanced soil dehydrogenase activity indicated a rise in the soil microbial activity. Yet, the Sandwich compost may allow the arbuscular mycorrhizal fungi to uptake P and the root development was also reduced.

In short, we may conclude that the Sandwich compost substrate reduced the root development (even though the available P augmented).

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Mineralogical and geochemical study of the Au mineralization at Imonga, Maniema (DRC)

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KEYWORDS. — Ore Geology; Gold; Petrography; Microthermometry; DR Congo.

SUMMARY. — The project focuses on the reconstruction of the formation history of quartz vein gold mineralization and disseminated gold mineralization in the metamagmatic and metasedimentary rocks at Imonga, DRC. Imonga is located in the Mesoproterozoic Karagwe-Ankole Belt, near the Paleoproterozoic Rusizi-Ubende Belt (Fernandez-Alonso *et al.* 2012). Near Imonga, alluvial and eluvial gold deposits were exploited. In-depth knowledge on the formation processes of the Au mineralization in the region and the precise relation to deformational events is still incomplete.

A petrographic study, resulting in a paragenetic sequence, was carried out on samples of two drill cores, collected near Imonga in 1953 (Kazmitcheff, 1961). The host rocks were deformed and underwent intense alteration. Four different vein generations were observed. Gold mineralization occurs in close association with sulphides in the second vein generation, which is mainly composed of quartz, ferroan dolomite and chlorite. Andalusite porphyroblasts formed prior to, and after, the second vein generation.

The mineralizing fluid was investigated by means of microthermometric analysis of primary fluid inclusions in the second vein generation and Raman spectroscopic analysis of the gaseous phase of these inclusions. The results indicate a general H₂O-NaCl-KCl-CO₂-N₂-CH₄-H₂S composition of the mineralizing fluid, compatible with a metamorphic origin. H₂S is characteristic for fluids carrying Au in reduced sulphur complexes. A formation window for the second vein generation was established ranging from 350° C to 400° C, based on isochores constructed from microthermometric data, P-T proxy formation conditions of andalusite in greenschist facies and observed quartz deformation structures. At 350° C an upper pressure limit of 240 MPa is proposed, and a lower hydrostatic pressure limit of 90 MPa.

The obtained results point towards orogenic gold mineralization at Imonga, probably of Early Neoproterozoic age. Gold was most likely transported as gold-sulphur complexes, which destabilized due to interaction with Fe-rich host rocks, resulting in the precipitation of Fe-sulphides and gold (Cools, 2022).

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Sulfones, Sickness and Segregation? The Landscapes of Leprosy Care in Congo (1930-1970)

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KEYWORDS. — Mission History; History of Medicine; Spatial Turn; Oral History; (Belgian) Congo.

SUMMARY. — In 2021 the World Health Organisation counted 140,546 new cases of leprosy. This is posing a public health threat to 135 mostly southern countries. Nonetheless, both public memory and modern historiography link the disease primarily to the period before 1950. Until then, leprosy was an incurable disease, disfiguring its poor sufferers to whom only Christian missionaries looked after in colonial leprosaria. Around 1950, with the advent of sulfone therapy, leprosy became for the first time in history a curable disease. Therefore most countries with a high prevalence of the disease phased down their leprosaria and focused henceforth on outpatient treatment.

An exception to this pattern was the Belgian Congo, which expanded its network of leprosaria during the 1950s, up to a moment when one in eight leprosaria worldwide were to be found in Congo. My master's thesis (2021) was the first study to tackle the unique case of Belgian Congolese leprosy care by analysing how three catholic leprosaria in the colonial *Équateur* province adapted themselves to the new pharmaceutical reality of the sulfonic period (1940-1960). A discourse analysis and audio-visual analysis applied to a wide corpus of sources showed that Belgian-Congolese leprosaria evolved into modern medical institutions, which aimed not only to heal their patients physically, but also to transform them socioculturally.

My ongoing doctoral research (2022-2026) will explore this matter further. Fourteen leprosaria, representative for the Congolese health landscape, will be examined for medical, sociocultural and spatial changes (1930-1970). Methodological innovative is the addition of ethnographic fieldwork in the Congo and the use of a threefold geographical lens which pays attention to the local site, the national context and the transnational missionary and scientific networks. By focusing, on the one hand, on a diversification process and, on the other hand, on the resilience of large leprosaria and the persistence of the age-old cultural ideas surrounding them, I want to present an historical way of understanding the specific Belgian approach to leprosy in Congo.

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Worrying about next meal: Food acquisition strategies and the experience of hunger among street children in Southwest Ethiopia

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KEYWORDS. — Street Children; Hunger; Food Acquisition Methods; Food Insecurity; Hunger Coping Mechanism.

SUMMARY. — Despite the enormous vulnerability of street children to food insecurity, there remains a paucity of scientific studies on the subject. In particular, little is known about the food insecurity experience of street children in low and middle-income countries where the majority of street children currently live. This study investigated the food insecurity experiences of homeless street children in Jimma city, Southwest Ethiopia. It explored food acquisition strategies, the experience of hunger, and hunger coping mechanisms. A qualitative phenomenological approach was used, following which data were collected through field observation, interviews, and focus group discussion. The findings suggest that street children fail to access adequate, safe, and stable food, thereby encountering massive hunger. Moreover, they lack the resources and sufficient income to change their dietary condition. This has heightened their vulnerability and made it very vexatious for them to overcome street life. Their food insecurity condition has been affected by several personal, institutional, social, and environmental factors. It is also complexly intertwined with their daily street life and is at the core of the vulnerabilities and adversities they face. Hence, it is important to recognize the complexity of this relationship and plan interventions that comprehensively address the underlying factors. This finding also underscores the urgent need for increased attention to recognize the alarming food insecurity condition among street children, particularly in low-income nations. It is hoped that this study prompts a dialog about addressing the unique dietary needs and nutritional vulnerabilities of street children in low-income countries both by governmental and non-governmental agencies.

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Variabilité climatique et productivité des pâturages naturels dans la zone soudano-guinéenne du Bénin

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MOTS-CLÉS. — Unité Bovin Tropical; Pâturage; Ressource végétale; Diversité floristique; Bénin.

RÉSUMÉ. — La forte pression anthropique associée aux effets néfastes des changements et variabilités climatiques impacte fortement la productivité des herbacées et des ligneux fourragers des pâturages naturels (Boni, 2021; Djohy *et al.*, 2022). La présente étude vise à évaluer la richesse et la diversité floristique, la productivité et la capacité de charge des pâturages de la zone soudano-guinéenne du Bénin dans un contexte de variabilité climatique. Les pâturages communaux de Tchaourou et de Djougou ont servi de support aux différents relevés floristiques de la végétation herbacée et ligneuse et à l'évaluation de la phytomasse et de la capacité de charge. Les méthodes de récolte intégrale de la phytomasse des herbacées (791 placettes de 1 m²) et d'estimation de la biomasse foliaire des ligneux fourragers à partir des mesures dendrométriques (113 placettes de 900 m²) ont permis d'obtenir les productivités des pâturages. Les séries climatiques de 1980 à 2019 des stations synoptiques de la zone d'étude ont été utilisées. Les analyses descriptives (moyenne ± écart-type), de variance et la spatialisation des productivités ont été réalisées grâce aux logiciels «R» et «ArcGIS». Les résultats révèlent une instabilité pluviométrique marquée par 52,5 % d'années pluvieuses déficitaires et 47,5 % d'années pluvieuses excédentaires durant les quatre dernières décennies dans la zone d'étude. Les séries pluviométriques observées entre 1980 et 2019 ont révélé une absence d'évolution significative des hauteurs de pluies (P= 0,426). Les températures moyennes ont augmenté de 26,8° C à 28,3° C (+1,5° C) au cours des quatre dernières décennies (P= 0,000). Il a été recensé lors de l'inventaire floristique 164 espèces réparties en 130 genres et 54 familles dont les plus représentées étaient les Fabaceae (20,7 %), les Poaceae (11,0 %: *Andropogon gayanus*; *Brachiaria falcifera*) et les Asteraceae (9,8 %). La productivité des pâturages varie d'un site à l'autre (de 0,7 à 1,5 t MS/ha), ainsi que la capacité de charge (de 0,11 à 0,43 UBT/ha). La spatialisation des données climatiques et des productivités a révélé que les pâturages de faible productivité (de 0,7 à 1,0 t MS/ha: 12 % de la zone d'étude) sont établis dans les zones à forte et moyenne variabilité climatique (28,2 % de la zone d'étude). Les pâturages de moyenne productivité (de 1,0 à 1,2 t MS/ha: 59,8 % de la zone d'étude) sont établis dans les zones à moyenne et faible variabilité climatique (59,8 % de la zone d'étude). Les pâturages de forte productivité (de 1,2 à 1,5 t MS/ha: 28,2 % de la zone d'étude) se situent dans les zones à faible et moyenne variabilité climatique (12 % de la zone d'étude). Ces différents résultats seraient très utiles dans le choix des politiques de gestion des pâturages et d'adaptation au changement climatique.

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Pratiques sociales autour de la Covid-19 et résilience des acteurs des secteurs de l'artisanat et du commerce au Sud du Bénin

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MOTS-CLÉS — Logique des acteurs; Pratique sociale; Covid-19; Résilience; Bénin.

RÉSUMÉ — La survenue de la pandémie de Covid-19, comme d'autres épidémies (Sida, SRAS, H1N1, Ebola, Lassa, etc.) a bouleversé non seulement la vie sociale des individus, mais aussi fait changer leur rapport à la maladie. Ce rapport est le plus souvent influencé par leurs discours, la façon dont ils se représentent la maladie et leurs expériences face à celle-ci. Cette communication interroge le rapport que les acteurs entretiennent avec la maladie, leurs attitudes face aux mesures de riposte mises en place par les pouvoirs publics pour ralentir la propagation de l'infection afin d'atténuer le choc subit par le système de santé et leurs stratégies d'adaptation et de résilience. S'inscrivant dans une démarche qualitative, le recueil des données effectué de juillet à octobre 2020 dans le sud du Bénin, a mobilisé les méthodes adéquates en anthropologie notamment l'entretien semi-structuré, les discussions libres, l'observation et l'administration d'un questionnaire. L'étude a pris en compte 119 acteurs des secteurs de l'artisanat et du commerce dont la plupart des activités socioéconomiques s'inscrivent sous le poids de l'informalité. Les catégories d'acteurs comprennent aussi les leaders religieux, les tradipraticiens et les autorités intervenant dans la riposte contre la Covid-19. On observe chez les acteurs interrogés une diversité de discours et une pluralité de logiques qui permettent de construire socialement la Covid-19 comme une maladie inventée et la conséquence d'une déviance sociale. Les construits sociaux autour de la maladie étant influencés par ses effets, les informations fortement médiatisées la concernant, les expériences des individus face à la maladie et les systèmes de référents culturels, ont connu une évolution rapide dans la fabrique des perceptions étiologiques et de nosologie. Ce qui permet de saisir les pratiques sociales, culturelles et thérapeutiques des acteurs très largement diversifiées à travers un pluralisme médical à prendre en compte dans les politiques de lutte. Pour les acteurs, les stratégies de riposte mises en place par les pouvoirs publics ne semblent pas être adaptées à leurs dynamiques socioéconomique et culturelle. Ainsi, on observe que les individus transforment leurs vécus quotidiens indépendamment des décisions politiques pour construire eux-mêmes leur univers stratégique d'adaptation et de résilience face à la maladie.

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Mortality in 888 persons living with epilepsy in Rwanda

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KEYWORDS. — Neurology; Epilepsy; Mortality; Verbal Autopsy; Sub-Saharan Africa.

SUMMARY. — **Introduction** Mortality among people living with epilepsy (PwE) is two- to threefold higher than in the general population. Worldwide, age-standardized mortality rates of epilepsy from unknown or genetic cause were calculated in 2016 at 1.74 per 100,000 people [1]. The highest mortality rates are observed in Sub-Saharan Africa with 5.4 more observed deaths than expected in the general population [2], and sudden unexpected death in epilepsy (SUDEP) reported as the most common cause of epilepsy-related death. The incidence of definite and/or probable SUDEP among PwE living in high-income countries is 1.2 per 1000 person-years. We prospectively estimated mortality and SUDEP rates in a cohort of PwE in Rwanda.

Methods We conducted a longitudinal study at the CARAES neuropsychiatric tertiary hospital, Kigali, and at three primary healthcare centres in the Northern district, Musanze. PwE, aged ≥ 15 years, were enrolled between February and December 2018. PwE not attending their study visit after 12 months were contacted for follow-up. Upon report of a death case by family members, a neurologist administered the WHO Verbal Autopsy Questionnaire to assess the cause of death.

Results Ten death cases out of a total of 888 PwE were identified yielding a mortality rate of 11.4/1000 person-years. Seven had an identified cause of whom 4 directly related to epilepsy including head trauma, brain hematoma and prolonged seizure/status epilepticus, and 3 not related to epilepsy. Three others were considered probable SUDEP yielding a SUDEP rate of 3.4/1000 person-years. Mortality rates in tertiary and primary centres were comparable.

Conclusion Mortality rates are high and in line with previous reports from Rwanda [3]. Improved treatment access and education of patients and families on death risks including risk factors for SUDEP, should be provided so to promote treatment compliance, ensure better seizure control and reduce mortality.

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Caractérisation de la dynamique récente (1991-2020) de la végétation au Burkina Faso dans le contexte de la variabilité climatique Faso à partir de l'imagerie satellitaire basse résolution

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MOTS-CLÉS. — Burkina Faso; Sahel; NDVI; SPOT VEGETATION; PROBA-V; RUE; Tendances.

RÉSUMÉ. — La question de la dégradation environnementale constitue un défi majeur pour les pays du Sahel. Le Burkina Faso, à l'instar des autres pays du Sahel, est confronté à cette problématique. La forte variabilité climatique observée dans cette région combinée aux pressions anthropiques (forte croissance démographique, urbanisation, migration, pratiques agropastorales, etc.) contribue à accentuer la dégradation du couvert végétal au fil du temps à travers sa modification. Malheureusement, l'insuffisance d'informations sur la dynamique des tendances récentes surtout à l'échelle locale et couvrant l'ensemble du pays constitue une préoccupation dans le cadre de la planification dans les politiques environnementales et de la gestion des risques environnementaux. Cette étude se veut être contributive dans l'analyse et la compréhension des tendances récentes de la végétation et des relations pluies-végétation, observées au cours de ces dernières décennies, au niveau du Burkina Faso, spécifiquement à l'échelle locale ou départementale (351 départements). Pour ce faire, les données de l'indice de végétation par différence normalisée (NDVI) des capteurs satellitaires SPOT VEGETATION et PROBA-V et de pluie (CHIRPS) respectivement sur la période 1999-2020 et 1991-2020 ont été acquises, traitées et analysées sous forme de série temporelle. L'objectif était d'identifier les changements spatio-temporels observés conduisant à des « zones de vulnérabilité potentielle ou hotspots » au niveau national. L'approche statistique est basée sur le test non paramétrique de Mann-Kendall au seuil de 5 %; l'indice de l'utilisation efficiente de l'eau (RUE); la régression linéaire et la corrélation de Pearson ont été utilisés pour analyser les dynamiques tendancielles et les relations entre la pluie et la végétation dans les différents départements. Les résultats montrent une forte variabilité interannuelle de la pluviométrie au cours de ces dernières décennies avec une tendance positive (cumul pluviométrique et événements pluvieux) dans plus de 96 % des localités administratives. Toutefois, en dépit de cette tendance en hausse de la pluviométrie, il a été observé globalement une dynamique régressive du couvert végétal au niveau national. En effet, 63 % des localités, soit 221 départements, ont présenté une baisse négative du couvert végétal, dont 14 % des zones présentant une régression négative forte (significative); contre 37 % des localités avec une tendance positive. Du reste, les tendances baissières du RUE observées dans les différentes localités indiqueraient que la pluviométrie enregistrée ne contribuerait pas significativement à l'amélioration du couvert végétal. De ce fait, le principal facteur de la dynamique régressive pourrait être anthropique expliqué par les pratiques agropastorales et l'accroissement des superficies agricoles moyennes annuelles observés au cours de ces dernières décennies dans les principales zones affectées par la réduction du couvert végétal. Ces résultats prolongent les observations d'études précédentes (Hountondji *et al.*, 2004, 2006) et soulignent l'impact anthropique croissant (Ozer *et al.*, 2010).

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Wood-borer infestation on mangrove forests of Kenya: Identification, threats and impacts

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KEYWORDS. — Marine Entomology; Taxonomy; Indian Ocean; Tree Health.

SUMMARY. — In a forest ecosystem, plant insect interactions often occur in a dynamic equilibrium. A shift from this equilibrium can lead to an increase of the insect's population, thus overwhelming the tree assemblage hence causing an outbreak. The dynamics of wood-borer infestation of a mangrove species (*Sonneratia alba* Sm.) in Kenya was investigated. Specifically, the extent of infestation, the insects responsible for the infestation, the infestation mechanism used by the insects and the trees' response to infestation by wood-borers was studied. To understand the extent and extend of the infestation, a survey in the entire coastal strip of Kenya was conducted followed by a detailed study of the infestation level. In order to know the wood-borers infesting *S. alba* mangroves along the Kenyan coastline, emergent insects from infested branches were trapped. Larvae and pupae obtained from infested branches were reared to adult stage in the laboratory. Samples of dead, recovered and non-infested *S. alba* branches were investigated for differences in their chemical contents paying attention to the relative proportion of polysaccharides and lignin compounds. Two wood-boring insects were identified: the beetle *Bottegia rubra* (Cerambycidae, Psebiini) and an undescribed genus of a metarbelid moth (Lepidoptera, Cossioidea). The *S. alba* infestation problem in Kenya is spread along the entire coastal strip and beyond. The registered 18 % level of *S. alba* forest infestation by the moth and the 25 % of *S. alba* forest infested by the beetle is worth the attention of all mangrove stakeholders. Insect-infested *S. alba* branches respond by increasing the production of phytochemicals as defence reinforcing their cell walls.

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Active rheology control of fresh cementitious materials using magnetic field

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KEYWORDS. — Civil Engineering; 3D Concrete Printing; Experiment; China.

SUMMARY. — 3D concrete printing is an innovative construction process for fabricating concrete components employing additive manufacturing technique. It needs to meet the contradicting requirements regarding pumpability, extrudability, and buildability, while currently, it is not straightforward to obtain a good balance between flowability and buildability for the same concrete mixture. Active control of structural build-up is a potential solution to overcome this challenge.

In this study, we achieved the active rheology control by activating an external magnetic field to a cementitious mixture with responsive additives. We first elaborated the typical magneto-rheological response of cementitious paste with nano-Fe₃O₄ particles by using small amplitude oscillatory shear technique. We found that applying an external magnetic field improves the liquid-like properties of the suspension at very early age due to the micro-agitation effect of the nanoparticles, and enhances the solid-like properties after a sufficiently long period of magnetization because of the formation of magnetic clusters (Jiao *et al.*, 2021a). Then the assumption of nanoparticles' movement in cementitious suspension was validated by conceptual calculations, and the formation of magnetic clusters was quantified by using image analysis technique (Jiao *et al.*, 2021b). At last, the application of active rheology control in extrusion-based 3D concrete printing is conceptually examined by using rheological experiments. It is revealed that residual magnetic clusters exist in the suspension after removing the magnetic field due to the remanent magnetization of the nanoparticles, resulting in a faster structural build-up of the mixture (Jiao *et al.*, 2022).

The results concluded that the structural build-up of cementitious materials after extrusion can be controlled on-demand by applying a pulsed magnetic field during extruding process. This finding offers an innovative methodology to actively improve the buildability of 3D printed cementitious materials, which can advance the development of 3D concrete printing technology in China.

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Understanding individual motivation to protect against volcanic risks among Goma population before the May 2021 Nyiragongo eruption, Virunga volcanic province (DR Congo)

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KEYWORDS. — Risk Mitigation; Self-efficacy; Protection Motivation; Trait Appraisal; Coping Appraisal.

SUMMARY. — The willingness to implement risk protective measures (protection motivation) differs between individuals; informing people about the risk they face may not be sufficient to generalize the implementation of protective measures. Therefore, an assessment of the individual psychological appraisal of the risk (threat appraisal) and protective measures (coping appraisal) is necessary to predict the protective behaviour. Using the Protection Motivation Theory, the study that this poster present, highlights determinants of the individual protection motivation of 2224 adults from height representative neighbourhoods of Goma before the Nyiragongo eruption of May 2021. Statistical analysis of survey's results shows that the protection motivation is mainly and positively shaped by the perception of the efficacy of the proposed risk protective measures and the capacity of the participant to implement them. To the opposite, negative determinants of the protection motivation include the interest in seeking information and a high-risk perception, proving a risk mitigation paradox – those most aware of the risk being the less likely to implement protective measures. A spatial contrast in coping and threat appraisals as well as in protection motivation is observed between the eastern part of the city, historically impacted by lava flows, and the western one, with higher values in the east. Being highly populated and exposed to several volcanic hazards, especially lava flows from the south flank of the Nyiragongo volcano, Goma needs an effective disaster risk mitigation program. Integrating evidence of this study into local disaster risk mitigation programs can contribute to improve their effectiveness.

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Differences in volcanic risk perception among Goma's population before the Nyiragongo eruption of May 2021, Virunga volcanic province (DR Congo)

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KEYWORDS. — Risk Perception; Perceived Severity; Perceived Vulnerability; Risk Awareness-raising; Volcanic Hazards.

SUMMARY. — Risk perception is an essential element to consider for effective risk management at time of eruption. This is especially the case in densely populated cities close to volcanoes like Goma in the east of the Democratic Republic of Congo highly exposed to volcanic hazards from Nyiragongo. The perception of volcanic risk involves the processes of collecting, selecting, and interpreting signals about uncertain impacts of volcanic hazards. Using a questionnaire survey, the study that this poster present, describes the spatial differences and factors influencing the individual volcanic risk perception of 2,224 adults from height representative neighbourhoods of Goma before the May 2021 Nyiragongo eruption. A composite risk perception indicator was built from the perceived severity and perceived vulnerability. Statistical analysis of survey's results shows that the risk perception varies less with demographic and contextual factors than with cognitive and psychological factors. The spatial analysis shows that respondents from the eastern neighbourhoods, affected by the 2002 eruption, demonstrated a significantly higher level of risk perception than participants living in the western neighbourhood. Therefore, collective memory of past events in the impacted areas does play a role. Evidence from this study will help to develop well-targeted volcanic risk awareness-raising in Goma.

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Sedimentology of the Kyandamu diamictite in the Katanga Supergroup (DRC): Paleogeographic implications for the Katangan Basin.

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KEYWORDS. — Geology; Sedimentary Petrology; Geochemistry; Depositional Environment; Tectonic Regime.

SUMMARY. — The Neoproterozoic Katanga Supergroup consists of a 10 km-thick series of sediments deposited between <880 Ma and 530 Ma (Master *et al.*, 2005). These Neoproterozoic formations are classically subdivided into three groups (from the base to the top): the Roan Group (predominantly composed of chemical sediments), the Nguba Group (chemical and detrital sediments) and the Kundelungu Group (predominantly detrital sediments). The Kyandamu diamictite (50 m thick in average) was deposited at the base of the Kundelungu. This study comprises fieldwork in the Lukutwe area and detailed sedimentological observations, which are based on the petrographic analysis of 50 thin sections and the interpretation of major and trace element content of 32 samples. The results suggest that the Kyandamu Formation is a diamictite with a predominantly a carbonate and clay-rich matrix containing unsorted pre-Katangan quartzite, granitoid and schist clasts (with an average size of 3 cm) mixed with Katangan dolomitic shale, dolomite and conglomerate clasts (less than 5cm in size). This distribution is indicative of both distal and proximal sediment supply. The high sphericity and roundness of the quartz grains stands in sharp contrast with the angular character of the carbonate lithic fragments and points to a gravity flow process with a possible significant aeolian input. The depositional environment was shallow and oxic, as shown by the U/Th, Ni/Co, V/Cr, V/ (V+Ni) and the “Indice de Variabilité de la Composition Chimique” (ICV; chemical variability index) ratios of 0.35, 2.55, 0.77, 1.38 and 1.88 respectively. An unstable tectonic setting is indicated by the Verma and Armstrong-Altrin (2013) diagrams and points to two different tectonic contexts: a continental rift and continental collision. In the regional context, this may be seen as evidence for a transition from a late extensional to an early compressional regime in the Lufilian Arc.

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Geometallurgical characterization of the cobalt black ore at Ruashi Cu-Co deposit (Katanga Supergroup, Democratic Republic of the Congo)

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KEYWORDS. — Roan Group; Mineralization; Cobalt Cap; Copper; Hydrometallurgy.

SUMMARY. — The Ruashi Cu-Co deposit is located in the eastern part of the Katanga Copperbelt. Cu-Co mineralization is hosted in the Mines Subgroup of the Roan Group (Mambwe *et al.* 2022). In the weathering zone, especially in the Kambove Formation (former “Calcaire à Minéraux noirs”) and in the Kinsevere Formation (former “Shale Dolomitique” Formation), cobalt is concentrated as black ore in a “cobalt cap” (Decrée *et al.* 2010; Mambwe *et al.*, 2022). This study focuses on the ore mineralogy, lithogeochemistry and hydrometallurgical testing of this ore, with a view on an improved extraction of Co. The cobalt black ore consists of massive and stratified dolostones which were weathered into a Co-Mn- rich clay. Heterogenite is the main mineral in the cobalt cap ore and is associated with minor amounts of chrysocolla and malachite. Minor amounts of carrollite, chalcopyrite, chalcocite and bornite are found in the unweathered fragments. Based on the ore mineralogy and lithogeochemistry, a classification of the ore is proposed: (1) oxide ore (Cu ratio: $\text{Cu (100xAS Cu/TCu)} \geq 75 \%$) and (2) mixed ore, with dominant oxides (Cu ratio: $\text{Cu (100xAS Cu/TCu)} < 75 \%$, with the copper sulfide chalcocite), characterized by a low concentration of Ni, Mn and Fe and the absence of talc. The recovery of Co contained in black ore was performed using a process comprising the leaching under reducing conditions (300-350 mV) with sulphuric acid (30 g/L) and leachate purification by solvent extraction (SX) to remove impurities ($\text{Cu} > 95 \%$ and $\text{Mn} \approx 99 \%$) in order to obtain cobalt as high-grade hydroxides (40.5% Co (OH)₂). Magnetic stirring (500 rpm) during 8h hours if the black ore into sulphuric acid gave the highest yield of Co (93 %), with concomitant leaching of Cu (40 %), Mn (84 %) and Fe (less than 5 %). Copper is the main economic by-product of the Co contained in the black ore.

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Structural analysis and evolution of the Cu and Cu (Zn, Pb) mineralizing fluids in the Katanga basin (Democratic Republic of the Congo)

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KEYWORDS. — Lufilian Orogeny; Mineralization; Fluid Inclusion; Copper.

SUMMARY. — The metasedimentary rocks of the Neoproterozoic Katanga Supergroup in the Central African Copperbelt (CACB) were deformed during the Pan-African orogeny and its post-orogenic period. The associated folding and faulting played an important role in the formation of the Cu-Co- (U) and the polymetallic Cu-Zn-Pb mineralization (Haest & Muchez, 2011; Mambwe *et al.*, 2022). This study is based on a structural analysis and fluid inclusion characterization completed at Tenke-Fungurume and Kambove mining district in the central part of the CACB. It aims at presenting a new fluid evolution and fluid flow model during the brittle tectonic events that affected the Nguba, Kundelungu and Bianco Groups in the Katanga Copperbelt (Kipata *et al.*, 2013). At the onset of the brittle tectonics, after the peak of the Lufilian orogeny (within the Monwezian phase-D2), a high salinity fluid (27.9 - 31.1 eq. wt % NaCl) with moderate homogenization temperatures ($T_h = 128-216^\circ \text{C}$) rich in copper circulated through the fractures and faults during a NE-SW transpression. At the end of the Lufilian orogeny, mainly during the late orogenic collapse, a high salinity fluid (26.7-36.0 eq. wt % NaCl) with low to moderate temperature ($T_h = 50-264^\circ \text{C}$) formed the Cu or Cu- (Zn, Pb) mineralization in the both Nguba and Kundelungu groups (eg. Shanika syncline and Kyaundji; cfr. Mambwe *et al.*, 2017, 2022). The post-Lufilian period started by the formation of Cu or polymetallic Cu (Zn, Pb, Ag) mineralization, caused by the mixing of a high salinity fluid (26.7-30.0 eq. wt % NaCl for type 1 inclusions) with meteoric water in the subsurface resulting in a fluid with a salinity range between 0.71 and 22.8 eq. wt % NaCl and a minimum temperature of 37 to 172° C). The extensional context of the East African Rift system was characterized by a decrease in salinity (<10 eq. wt % NaCl) due to the abundance of meteoric water. These low salinity fluids caused the remobilization of copper and the formation of secondary deposits.

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Labial-velar consonants in Sakata (Bantu C34): Preliminary phonetic and phonological observations

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KEYWORDS. — Phonetic Documentation; Articulation; Acoustics; Sound Change; African Languages.

SUMMARY. — The present contribution, based on fieldwork data collected by members of the BantUGent research team in June 2021, bears on the documentation and description of labial-velar consonants in several Bantu zone C varieties (namely, kiBayi, kiNzinzale, kiNgingia, kiNgingele, and kiTere) belonging to the so-called “Sakata cluster” in southwestern Congo. These phonemes, often considered typical of a linguistic area known as the “Macro-Sudan Belt”, are considerably more common in southern Central Africa than previously thought. The case of the Sakata varieties at hand represents one of particular descriptive interest, considering the wide array of labial-velar articulations these lects present. First, a spectral analysis of the available data is provided, touching upon the question of whether some of the sounds documented here should be described as labial-velar fricatives. Second, well-established models of sound change are reviewed and tested against the new data, with special focus on the kiNgingele case. It is argued that some sound changes at play in kiNgingele ought not to be explained in purely articulatory terms, as other sociolinguistic variables may have intervened in informing them. In conclusion, it is proposed that the presence of labial-velars in Sakata may be part of a broader set of arguably “uncommon” linguistic features present in northwestern Bantu languages: this, in turn, might point to the fact that the languages of the region went through stages of much greater phonological diversity than suggested by today’s relative homogeneity. Sakata labial-velars may just be one trace of this diversity.

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Customary Authority and State Administration in Haut-Uélé: Between Inclusion and Exclusion

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KEYWORDS. — Customary Authorities; Local Governance; Ethnographic Fieldwork; Democratic Republic of Congo; Haut-Uélé.

SUMMARY. — Although customary authorities are the lowest level of public administration in the Democratic Republic of Congo (DRC), and closest to the population in rural areas, post-colonial governments tried several times to exclude them from public administration. As a result, different laws (Law 73/015; Law 73/250) were voted in their disadvantage. However, customary authorities managed to remain in the state administration and continue to provide public services in the countryside. This presentation will illustrate, based on ethnographic fieldwork in Haut-Uélé province, how customary authorities managed to persist in the state administration. Thus, my argument has two parts: first, chiefs managed to stay in the state administration thanks to their adaptive capacity. Second, the absence of the state in Congolese rural areas, in this case Haut-Uélé, played a major role in chiefs' ability to remain in the state administration. These arguments help to gain a better insight on customary administration in local governance and how chiefs provide public services in areas far from the capital city, Kinshasa.

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Uncontrolled exploitation of *Pterocarpus tinctorius* Welw. and associated landscape dynamics in the Kasenga territory: Case of the rural area of Kasomeno (D.R. Congo)

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KEYWORDS. — Landscape Dynamics; Anthropisation; *Miombo* Woodland; Agricultural Development; Landscape Ecology.

SUMMARY. — The uncontrolled logging of *Pterocarpus tinctorius* Welw., in the Kasenga territory in the south-east of the Democratic Republic of the Congo is of significant socio-economic benefit, but is above all a threat to the stability of forest ecosystems. Based on Landsat images from 2009, 2013, 2017, and 2021, the landscape dynamics of a *P. tinctorius* exploitation area, the Kasomeno region in the Kasenga territory, were quantified using a mapping approach coupled with landscape ecology analysis tools. The results reveal a continuous loss of forest cover over all the periods studied, clearly more marked between 2013 and 2017, through the dissection of patches. Also, through the spatial process of suppression, the fields recorded a regressive dynamic between 2013-2017, a sign of abandonment of agricultural activity in favour of *P. tinctorius* logging. These landscape dynamics are the consequences of strong anthropic activities in the study area leading to an important savannahisation. Consequently, the level of landscape disturbance doubled from 0.8 to 1.7 between 2009 and 2021. Our results suggest that, without regulatory enforcement, illegal logging of *P. tinctorius* dangerously compromises forest ecosystem health and household food security in the region.

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Perceptions of forest ecosystems and their management by local populations in the Kasenga territory (Haut-Katanga, Democratic Republic of the Congo)

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KEYWORDS. — Sustainable Forest Management; Endogenous Knowledge; D.R. Congo.

SUMMARY. — Many well-intentioned analyses and actions continue to be implemented to preserve the environment, but in a fog of ambiguity surrounding the definitions of the term “forest”. This study analysed different perceptions of forests and their management by inhabitants of Kasenga in south-eastern D.R. Congo through surveys involving 112 structured interviews. Using this technique, the same set of predetermined questions was used for the interview set. The questions were asked in the same order and responses were scored using a standardized scoring system to ensure fairness. The data collected and subjected to descriptive statistics show that the inhabitants of Kasenga rely on socio-ecological aspects to define forest ecosystems. Most often, forests in Kasenga are considered to be places of survival, not inhabited by humans, consisting of trees, grasses, animals and waterways. These forests are also considered to be rich in soil fertility and suitable for agriculture. However, activities such as agriculture, timber exploitation and traditional medicine have been identified as the main causes of deforestation, responsible for the reduction of plant species, the rarefaction of large fauna, the impoverishment of soils and the advance of the savannah. Faced with this, local people suggest monitoring timber exploitation, creating jobs, reforestation, and abandoning inappropriate agricultural practices. In view of these results, we believe that efforts to orient policies for sustainable forest management and exploitation must take into account the knowledge of people living near forests.

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Étude de la pollution atmosphérique par les matières particulaires PM_{2,5}, PM₁₀ et les ETM le long de la route Kasapa dans la ville de Lubumbashi, R.D. Congo

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MOTS-CLÉS. — Toxicologie et environnement; Pollution atmosphérique; Milieu urbain; République Démocratique du Congo.

RÉSUMÉ. — Les matières particulaires (PM) avec les éléments traces métalliques (ETM) qu'elles peuvent véhiculer constituent un important facteur de pollution de l'air, particulièrement en milieu urbain où le trafic routier est dense.

Ce travail étudie l'impact du trafic routier et de l'activité minière sur la concentration en ETM dans les dépôts atmosphériques solides, les PM_{2,5} et PM₁₀ (particules de diamètre inférieur à respectivement 2,5 µm et 10 µm) dans l'air ambiant le long de la route Kasapa, une route urbaine avec trafic important.

Quinze cents mesures des PM, dont 700 en saison sèche et 800 en saison de pluie, ont été faites *in situ* à l'aide d'un détecteur à rayon laser, et les ETM analysés par spectrométrie plasma à couplage inductif (ICP) sur 159 échantillons de dépôts atmosphériques solides, des pneus et des plaquettes de freins; les dépôts atmosphériques ont été recueillis sur des plaques en verre placées à une hauteur d'environ 3 mètres. L'étude a été réalisée sur 25 points repartis en 5 stations de mesure, y compris à proximité d'une entreprise minière.

Des pics de PM ont été enregistrés à proximité immédiate de l'axe routier, aux croisements des routes et à proximité de l'entreprise minière. La présence d'ETM y a été observée.

Position des points	PM _{2,5} µg/m ³	PM ₁₀ µg/m ³
Axe routier	112,44 - 158,70	181,78 - 236,10
Site minier	112,00 - 308,23	248,17 - 400,24

Position des points	Cd (ppm)	Co (ppm)	Cu (ppm)	Ni (ppm)	Zn (ppm)
Axe routier	4,04 - 5,99	135,60 - 173,55	580,80 - 706,42	10,6-18,60	1104,23-1360,12
Site minier	-	1117,4	5426,33	199,3	-

Matrice	Cd (ppm)	Co (ppm)	Cu (ppm)	Ni (ppm)	Zn (ppm)
Plaquette de freins	16,23	164,40	11610,00	223,24	5350,67
Pneu	--	351,16	1030,00	113,71	11236,67

Ces résultats mettent en évidence sur les sites étudiés un degré de pollution particulaire et en ETM supérieure aux normes de l'OMS et de l'US Environmental Protection Agency (US EPA). Cette pollution serait due principalement au trafic routier par l'usure des pneus et des plaquettes de freins pour le site routier et aux activités minières pour le site proche de l'usine.

Ils soulignent en même temps la pertinence de la problématique de la pollution atmosphérique à Lubumbashi, et la nécessité de mener des études sur les dépôts atmosphériques liquides et de les étendre à des sites urbains éloignés du trafic routier et des installations industrielles.

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Modélisation de l'érosion hydrique par l'équation universelle de perte de sols révisée (RUSLE) dans le bassin versant Talihya Nord (Nord-Kivu, Est de la République Démocratique du Congo)

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MOTS CLÉS. — Taux d'érosion; Modèle RUSLE; Utilisation des sols; Pratiques antiérosives; Territoire de Lubero.

RÉSUMÉ. — L'érosion hydrique des sols en milieu agricole constitue un problème environnemental, économique et social grave qui mérite une attention particulière. Ce problème se pose avec acuité dans le territoire de Lubero, province du Nord-Kivu à l'Est de la République Démocratique du Congo. Il constitue le principal facteur de la dégradation des sols dans ce territoire. Cette étude vise à quantifier les pertes de terre par érosion hydrique dans le bassin versant Talihya Nord (580,77 km² de superficie) en 1987, 2001 et 2020. En effet, ce bassin versant de montagne est une zone densément peuplée avec une agriculture (production des cultures maraîchères, vivrières et industrielles) qui surexploite le sol et l'expose à la dégradation. C'est pourquoi, la quantification des pertes en sols dans ce bassin versant a été effectuée en utilisant le modèle RUSLE combiné aux Systèmes d'Information Géographique et aux techniques de télédétection. L'érosivité des pluies a été calculée à partir des précipitations de la base de données WorldClim 2.1; les valeurs d'érodabilité sont issues de la base des données des sols ISRIC; les valeurs de l'inclinaison et la longueur des pentes ainsi que du facteur de pratique antiérosive ont été calculées à partir d'un Modèle Numérique de Terrain ; et la couverture végétale est issue des images satellitaires Landsat TM⁺ et OLI TIRS.

L'étude montre que dans le bassin versant Talihya Nord, la moyenne des pertes de terre (érosion actuelle) qui était estimée à 25,61 t ha⁻¹ an⁻¹ en 1987, est passée à 35,21 t ha⁻¹ an⁻¹ en 2001 et puis est descendue à 28,17 t ha⁻¹ an⁻¹ en 2020. Ces différences de pertes de sols sont dues au changement de l'occupation des sols, avec une grande partie de la surface du bassin versant qui a été convertie en sols nus et champs agricoles. L'érosion potentielle (supposant que le sol n'est pas couvert et aucune mesure antiérosive n'est entreprise) en 2020 dans ce bassin versant est en moyenne de 205,24 t ha⁻¹ an⁻¹. En effet, l'absence de la couverture végétale et la non application des pratiques antiérosives justifieraient ces pertes énormes de terres. Ainsi, l'érosion potentielle est 7 fois supérieure à l'érosion actuelle. Les surfaces forestières occupent en 2020 environ 123 km² sur 580,77 km² du bassin versant alors que les savanes occupent environ 86 km². Le taux annuel d'érosion hydrique varie avec les classes d'occupation des sols considérées pour l'année 2020. Ce taux est élevé sur sols nus et zones bâties (136,23 t ha⁻¹ an⁻¹) et sous cultures et jachères (120,13 t ha⁻¹ an⁻¹). Par contre, les pertes de sols par érosion hydrique sont beaucoup plus faibles au niveau des forêts naturelles et plantées (33,11 t ha⁻¹ an⁻¹) et des savanes (64,24 t ha⁻¹ an⁻¹). Par ailleurs, le bassin versant Talihya Nord étant situé dans une zone vouée à l'agriculture vivrière et maraîchère, l'installation des champs agricoles a influencé la régression de la surface forestière. Dans ce contexte d'anthropisation croissante, la mise en place des mesures d'aménagement pour lutter contre l'érosion hydrique (haies antiérosives, terrasses, etc.) ferait partie des stratégies de mitigation outre l'adoption, par les agriculteurs, des itinéraires techniques adéquats (non labour, apport de la matière organique, agroforesterie etc.), pour garantir une gestion rationnelle des ressources naturelles et réhabiliter le rôle de grenier de la République Démocratique du Congo.

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Impact of domestication on Katangan *Vitex* chemical constitution

Welcome MUYUMBA NONGA^{1,2,3,*}, Désiré NUMBI MUJIKE⁴, Salvius BAKARI AMOURI³, Kahumba BYANGA³, Mylor NGOY SHUTCHA⁴, Jean-Baptiste LUMBA SIMBI⁵, Pierre MEERTS⁶, Edouard NGOY KIHUYA¹, Amandine NACHTERGAE² & Pierre DUEZ²

KEYWORDS. — Agnuside; Iridoid Glycoside; Cultivated Plants; Chemical Profiles; *Vitex Fischeri*.

SUMMARY. — The leaves and roots of *Vitex* are used in ethnomedicine in many countries of the tropical region (Amuri *et al.*, 2017); however, the limited occurrence of the plants and the protection of these species necessitate to conduct the search for the species domestication an alternative mean to obtain this plant material (Mofokeng *et al.* 2022). In the present study, culture trials were applied to obtain plant material of three *Vitex* species, namely *V. doniana*, *V. fischeri* and *V. mombassae* using different fertilizers, *i.e.* chicken droppings, urea, and a mid-chicken droppings urea. Control plants were grown without any fertilizer. Their phytochemistries qualities were evaluated using high performance thin-layer chromatography and high-performance liquid chromatography-mass spectrometry. The chemical profiles of leaves grown with different fertilizers were comparable and but agnuside, a biologically important iridoid glycoside was detected only in the cultivated plants indicating a slight switch in biogenesis pathways.

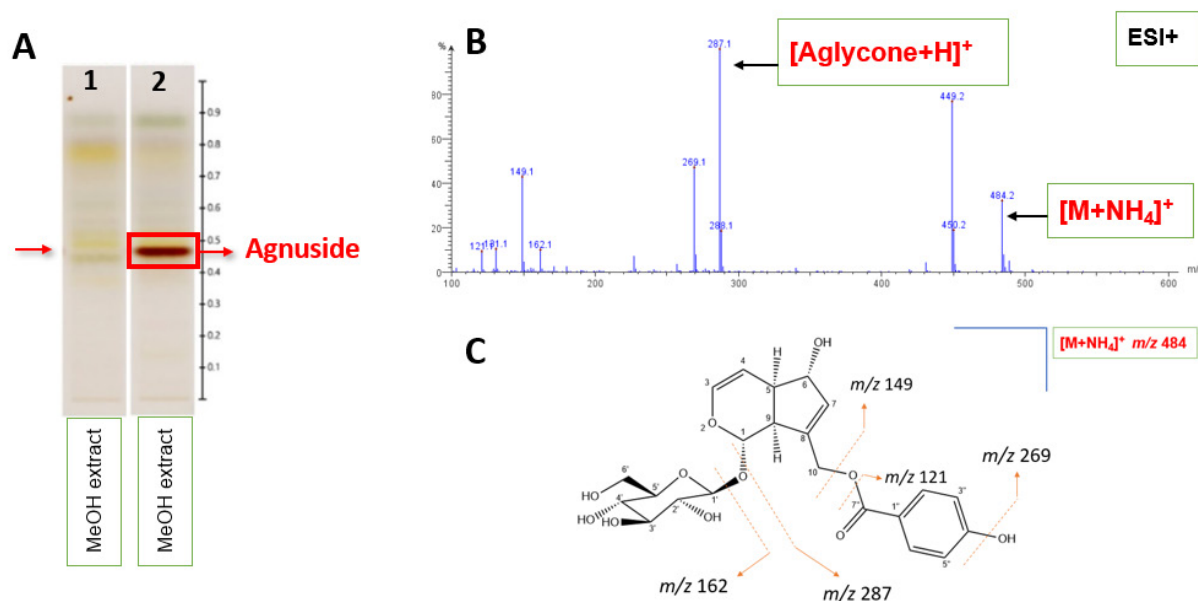


Fig. 1. — **A**: HPTLC fingerprints identifying agnuside in methanolic extract of domesticated *V. fischeri* leaves. Track 1: wild type *V. fischeri* and track 2: domesticated *V. fischeri* using urea as fertilizer. Mobile phase: ethyl acetate-methanol-water (77:15:8, v/v/v); derivatization with vanillin reagent + sulfuric acid. Examination in daylight. HPTLC plate (20cm×10cm), silica gel 60 F254; **B**: Spectre de masse en mode electrospray positif de l'agnuside (m/z 466); **C**: proposed fragmentation pathway of agnuside.

Bioassays with cultivated plants would be needed evaluate the impact of growth condition on properties.

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La protection des personnes handicapées en temps des conflits armés: défis et perspectives

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MOTS-CLÉS. — Action humanitaire; Protection; Inclusion; Handicap; Conflit armé.

RÉSUMÉ. — Touchées par une crise humanitaire de grande ampleur et aux facettes multiples, quelque 12,8 millions de personnes dont 5,6 millions d'enfants de moins de dix-huit ans ont besoin d'assistance humanitaire et de protection en 2019 en RDC, soit près de 13 % de la population totale projetée du pays [1]. Parmi les facteurs de cette crise, les conflits armés jouent un grand rôle particulièrement dans la partie Est du pays (depuis deux semaines maintenant les choses se compliquent avec la progression du M-23 par exemple, en province du Nord-Kivu), avec plus de conséquences sur les populations civiles dont les femmes, les enfants et les personnes handicapées. Si en temps normal (de paix) les personnes handicapées subissent des violations graves de leurs droits, la situation devient plus complexe lors d'une crise humanitaire (conflits armés, par exemple). C'est ce que confirme Handicap International en ces termes: «pendant les crises humanitaires, le taux de handicap est plus élevé. Environ 10 millions des personnes déplacées dans le monde, sont des personnes en situation de handicap» [2]. Ainsi, nous avons trouvé utile d'analyser comment les personnes handicapées sont-elles protégées en temps de conflits armés au Nord-Kivu, dans le cadre de l'action humanitaire.

Grâce aux méthodes exégétique ou méthode juridique, l'herméneutique et l'analyse structurale appuyées par trois techniques dont la documentation, l'entretien ciblé et l'observation participante; nous sommes parvenu à analyser la situation des personnes handicapées en contexte de conflits armés, cas particulier de la province du Nord-Kivu en République Démocratique du Congo. Au-delà de quelques chiffres saillants disponibles, reflétant la vulnérabilité des personnes handicapées dans un contexte de crise humanitaire, la communication se consacre à partager les défis de prise en compte des personnes handicapées dans l'action humanitaire mise en place dans le cadre de la protection des victimes des conflits armés au Nord-Kivu. Par conséquent, elle propose de mécanismes pratiques en termes de perspectives pour relever ces défis, combler les gaps orchestrés par l'action humanitaire et améliorer la situation des personnes handicapées en leur garantissant une protection efficace et effective en temps de conflits armés.

NOTES

[1]Bureau de la Coordination des Affaires Humanitaires (UNOCHA), *Plan de réponse humanitaire 2017 – 2019 pour la RDC*, UNOCHA, décembre 2018, p. 6.

[2]Handicap International, *Le processus HNO/HRP: La nécessité de prendre en compte les personnes handicapées dans l'action humanitaire*, présentation Power Point Inédit, août 2019.

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Competence of biogas production from dragon fruit branch co-digested with pig dung

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KEYWORDS. — Anaerobic Digestion; Biochemical Methane Potential; Biogas Production; Dragon Fruit Branch; Pig Dung.

SUMMARY. — Utilization of dragon fruit (*Hylocereus* spp.) branch – a natural source accessible in great quantity, in biogas production targets not only to fulfill the enhancing demands for green energy but also to increase waste valorization as well as to improve the added-value of this fruit. However, there is a lack of research on the promising biogas production from this component. Thus, this study was aimed to employ the biochemical methane potential tests to analyze the optimized ratio between branches and pig dung (0, 25, 50, 75, and 100 %), ratio between feedstock and inoculum (1:1, 1:1.5, 1:2, and 1:2.5 g/mL), ratio between solid mixture and water (1:1, 1:2, 1:3, 1:4, 1:5, and 1:6 g/mL), percentage of added seedings (0, 10, 20, and 30 %), and incubating temperature (27, 35, and 50°C) for effective methane production. For all the mixtures of plant components, dungs, inoculum, seeding, and water, biogas productivity tended to intensify considerably in the first eight to fourteen days, culminated at peak during operating duration, and then began to diminish promptly in the next following days. Sole dragon fruit branches were fermented for 22 days until biogas yield was less than 1 %, while sole manure and the mixtures of plant components and dungs were anaerobically digested for 17 to 21 days. The appropriate ratio between dragon fruit branches and pig dung, feedstock and inoculum, solid mixture and water, percentage of added seedings, and incubating temperature were 50 % for dragon fruit branches and 50 % pig dung, 1:2 g feedstock/mL inoculum, 1:5 g solid mixture/mL water, 20 % added seedings, and around 27°C, respectively. At these optimized conditions, the accumulative biogas concentration was 2628 mL after 22 working days. To sum up, dragon fruit branches are potential for biogas production, and the optimal conditions could be used for further bigger model or pilot plant.

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Du droit applicable aux déplacés environnementaux au Burundi: regards critiques et perspectives de lege ferenda

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MOTS-CLÉS. — Groupes vulnérables; Changements climatiques; Convention de Kampala.

RÉSUMÉ. — Le Burundi est exposé aux catastrophes naturelles, responsables de 80 % de la population déplacée. Dès lors, les déplacements prédisposent les déplacés aux divers textes juridiques internationaux pour s'assurer de l'octroi, au même titre que d'autres groupes vulnérables, de certains de leurs droits. Ils sont ainsi soumis à un arsenal juridique à régime commun, parfois difficile à appliquer au contexte particulier et exigeant de leur état. Le présent travail consiste à jeter un regard critique sur le contenu et l'effectivité du droit applicable en cas de catastrophes naturelles et à analyser les raisons du retard dans la mise en place d'une loi interne sur la protection et l'assistance des déplacés environnementaux au regard de la Convention de Kampala que le pays a signée. En outre, les problèmes de protection et les besoins des déplacés environnementaux étant complexes et variés, un cadre juridique adapté à leur situation sera de lege ferenda proposé. Tout compte fait, la protection dont disposent les personnes déplacées, suite aux changements climatiques, est insuffisante et se doit d'être améliorée. Au regard de la fréquence et de la gravité des catastrophes naturelles ou d'origine humaine et leurs effets destructeurs, un droit international les protégeant s'avère nécessaire. Le chantier de leur protection est en général partout gigantesque et plus particulièrement au Burundi.

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Insécurité alimentaire et résilience au Burkina Faso: Analyse comparée des ménages des Personnes Déplacées Internes (PDI) des centres d'accueil et des ménages locaux dans la commune de Kaya

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MOTS-CLÉS. — Burkina Faso; PDI; Insécurité; Résilience; Terrorisme.

RÉSUMÉ. — Le Burkina Faso présente un contexte national multi-crisis: (i) vulnérabilité au climat, (ii) sanitaire, (iii) politique et (iv) sécuritaire (De Longueville *et al.*, 2016, 2020; Ozer *et al.*, 2022). En particulier, ce pays connaît depuis 2015 une insurrection djihadiste qui a occasionné plus de 2000 morts, dont plus de 500 forces de défense et de sécurité. Cette crise terroriste interagit avec les autres crises précitées, provoquant un déplacement massif de population à l'intérieur du pays et une grave insécurité alimentaire dans ce pays. Selon le Ministère en charge de l'action humanitaire, le nombre de Personnes Déplacées Internes (PDI) est estimé à 1 719 332 personnes au 30 septembre 2022. Cette situation complexe et multi-factorielle compromet la sécurité alimentaire et nutritionnelle des burkinabè. En 2021, près d'un burkinabè sur deux (46%) a été directement affecté par l'insécurité et ses conséquences. L'insécurité alimentaire et nutritionnelle s'est accentuée dans ce pays avec au moins 2,6 millions de personnes supplémentaires. Dans ces conditions, des recherches sur la résilience des ménages dans ce pays s'imposent. Notre étude s'est focalisée sur les facteurs de la résilience des ménages des centres d'accueil des PDI et des ménages locaux de la commune de Kaya, première commune d'accueil des PDI. En nous inspirant du cadre d'analyse de la résilience de la FAO (RIMA-II) et en menant une enquête et des focus groups auprès des ménages de PDI des centres d'accueil et des ménages locaux de Kaya sur la période avril-mai 2022, nous obtenons les principaux résultats suivants: la capacité de résilience des ménages de la commune de Kaya, appréciée principalement par l'accès aux services de base, les filets de protection sociale, les actifs productifs et non productifs et les sources de revenus des ménages, est faible et varie selon les catégories de ménages de cette commune. Les ménages des PDI des centres d'accueil sont les plus affectés par les diverses crises que traverse le Burkina Faso. Cette étude implique de ce fait des mesures de politiques de résilience parmi lesquelles, la lutte contre l'insécurité, une amélioration des revenus des ménages, une amélioration de la qualité des services sociaux de base et une amélioration de l'assistance humanitaire au profit des différentes catégories des ménages de Kaya.

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Analyse organisationnelle des sociétés de traitements phytosanitaires agréées dans la région du littoral (Cameroun)

Josiane OUOGUEP MOTOUO^{1,*}, Jean Pierre MBA¹, Charles Shey NYING²
& Delor Magellan KANSEU³

MOTS-CLÉS. — Organismes nuisibles; Produits homologués; Agrément; Convention des soins; Cameroun.

RÉSUMÉ. — L'alimentation est un droit fondamental pour tous les êtres humains. Cependant, elle dépend fortement de la qualité des végétaux. Chaque année, 40 % de la production agricole camerounaise est perdue par l'attaque d'organismes nuisibles tels que les charançons, rongeurs, mollusques.... La prévalence actuelle d'infestation des magasins de stockage de céréales (riz, maïs, etc.) et le refoulement des fruits tels que les mangues destinées au commerce international pour le même motif interpellent sur la qualité des traitements phytosanitaires (COUNTER 15 FC, PROTESCIAGE, ALADIN...). Bien qu'ils améliorent les rendements, réduisent les pertes post-récoltes et empêchent la dissémination des organismes nuisibles vers d'autres pays, ils peuvent être un risque pour la santé humaine, animale et environnementale lorsque son application par les sociétés de traitement est contraire à la réglementation. La présente étude analyse le système organisationnel des sociétés de traitements phytosanitaires agréées dans la région du littoral au Cameroun, principal point d'entrée et de sortie des produits sur le territoire national. La démarche de collecte des données s'est effectuée par la méthode quantitative à travers des interviews auprès de 98 responsables de sociétés assistés de leur technicien. Ensuite, une inspection des locaux et une évaluation de leurs équipements de traitement a été effectuée. Les procès-verbaux et les check-lists ont permis de recueillir des informations. Les résultats ont révélé que 72 % des sociétés agréées disposent de locaux conformes à la réglementation en vigueur contre 28 % non conformes. A propos des équipements, 34 %, 38 % et 28 % des sociétés agréées possèdent du matériel moderne suffisant et diversifié, peu et pas du tout de matériel respectivement. La majorité des sociétés agréées (72 %) travaillent avec des techniciens, tel que recommandé par leur agrément et font usage de produits homologués. En revanche, 28 % des sociétés travaillent avec des amateurs et font usage parfois de produits non homologués. 54 % des sociétés disposent des attestations de traitement phytosanitaire cosignées par le ministère de l'agriculture et appliquent effectivement la convention des soins sanitaires. Ainsi, les activités de 46 % des sociétés ne sont pas réellement supervisées et n'appliquent pas la convention des soins sanitaires et se livrent à des pratiques informelles. Ces différents résultats sont importants pour une réorganisation et une meilleure gestion du sous-secteur des traitements phytosanitaires.

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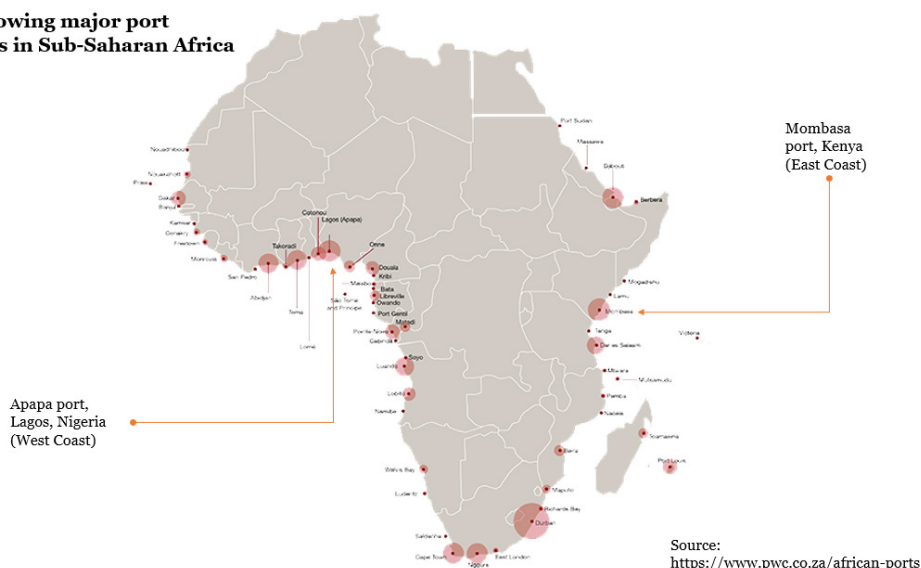
Towards a next phase of port reform in Africa: An analysis of context, drivers, performance and options

Adekola OYENUGA^{1,*}

KEYWORDS. — Port Reforms; Political Economics; Political Settlements; Institutions; Africa.

SUMMARY. — Like their counterparts in other parts of the world, Africa's maritime ports have been subjected to extensive reforms in recent decades. These reforms have aimed to increase operational efficiency and the effectiveness of governance; reduce the financial burden borne by the public sector; and increase private sector participation. While improving average port performance, the reforms have significantly failed to deliver the lofty ambitions of the reformers. In some cases, full implementation of the reforms have been stymied by the resistance of powerful vested interests. As a new phase of African port reforms becomes inevitable, it is pertinent to ask why the preceding reforms under-performed. What can we learn? How should these lessons influence the next phase of reforms? The paper focuses on reforms conducted within the past two decades at the Apapa port of Lagos, Nigeria, on the West coast of Africa, and the Mombasa port of Kenya, on the East coast. It applies the theory of political settlements (Khan, 2010) to examine the impact of the local political economy on port reform performance. A political settlement describes a 'social order' based on political compromises between powerful groups in society that sets the context for institutional and other policies. A settlement is sustainable when its inherent power distribution supports an institutional structure (or reform) that allows dominant principals to control the distribution of benefits from existing or new institutions. This paper identifies that African ports may indeed suffer from underperforming port reforms, not because the reforms have been mis-judged *per se*, or that existing institutions are inadequate or ineffective, but rather because the local political settlement has not been adequately taken into consideration prior to implementing the reform. A second insight is that where the political context remains exogenous to the reformers and non-supportive of a reform agenda, it may be advisable to reformulate the reform ambitions, focusing instead on limited, scaled-down interventions, that are deployed to 'islands-of-effectiveness' where there is a perceptibly higher chance of success.

Map showing major port facilities in Sub-Saharan Africa



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Contribution à la résilience du système éducatif malgache: Étude de la mise en place d'un système intégré de surveillance et alerte précoce scolaire en insécurité alimentaire

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MOTS-CLÉS. — Insécurité alimentaire; Abandon et absentéisme scolaires; Résilience; Système éducatif; Grand Sud de Madagascar.

RÉSUMÉ. — Les trois régions du Grand Sud de Madagascar à savoir Androy, Anosy et Atsimo Andrefana sont fortement impactées par la sécheresse et l'insécurité alimentaire. Selon les Nations Unies, en 2021: «Madagascar est le premier Pays confronté à une détresse alimentaire liée au changement climatique... c'est le seul endroit au monde à l'heure actuelle où les conditions semblables à la famine ont été provoquées par le climat et non par les conflits» [1]. Il s'agirait de la pire sécheresse que le Sud de Madagascar ait connue en 40 ans, occasionnant plus d'un million de victimes de la faim, parmi lesquelles figurent 500.000 enfants [2].

En conséquence, l'apprentissage y est souvent compromis. Les enfants sont souvent contraints d'abandonner l'école pour un temps ou de façon indéfinie. Le taux de décrochage et d'abandon scolaire du niveau primaire y est parmi les plus élevés du pays, s'élevant à 16,5 % pour les trois régions contre une valeur nationale de 7,7 % [3].

Pourtant, le droit à l'éducation est un droit fondamental et d'une part, la Convention des Nations Unies relative aux droits de l'enfant préconise aux Etats l'ayant ratifiée de prendre des mesures pour encourager la régularité de la fréquentation et la réduction des taux d'abandon scolaire. D'autre part, un système est qualifié de hautement résilient quand il y a un consensus quant aux défis importants, quand le risque est partagé et les réactions à l'occurrence d'un événement sont coordonnées.

Partons de l'hypothèse que la résilience du système éducatif face aux risques et catastrophes est tributaire de la résilience de l'apprenant, de celle de l'enseignant, et plus globalement mais de façon plus conséquente, de celle de la gouvernance du système éducatif. Il est judicieux de trouver un mécanisme au service de la résilience qui puisse prévenir les impacts de la sécheresse et de la famine en milieu scolaire et en même temps de proscrire le phénomène d'abandon et d'absentéisme scolaire.

Le présent projet de recherche a pour défi complexe l'étude de la mise en place d'un système intégré de surveillance et d'alerte précoce scolaire en sécurité alimentaire. L'objectif premier est de permettre l'identification précise et factuelle des états précurseurs et subséquemment, de permettre l'activation d'un programme d'actions scolaires de prévention basées sur l'anticipation.

NOTES

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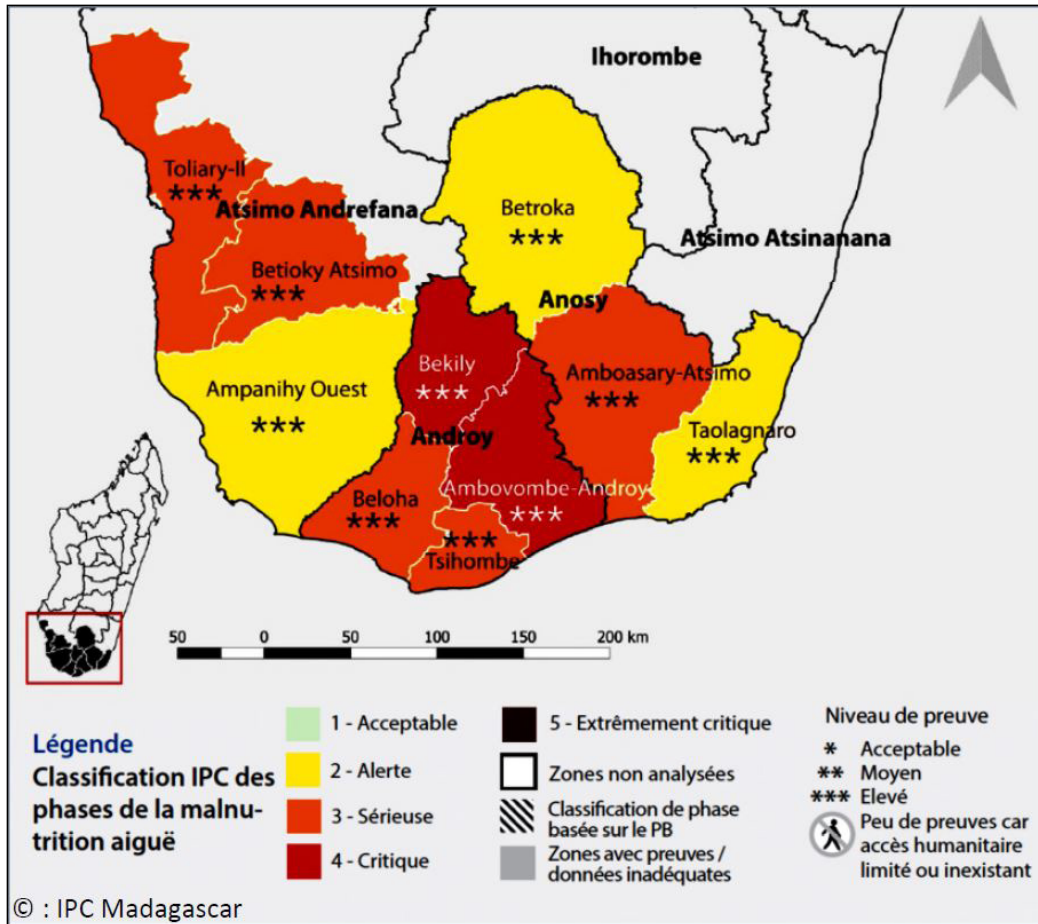
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ANNEXE

Carte de la classification IPC de l'insécurité alimentaire des 3 régions Androy, Anosy et Atsimo Andrefana du grand Sud de Madagascar, situation Mai – Aout 2021



Source: IPC Madagascar Food and Security Nutrition Snapshot, July 2021.

Gestion de la sécheresse dans le Grand Sud de Madagascar dans le cadre de la gestion durable des ressources en eau

Rebecca RAKOTOMANGA ZOLALAINA^{1,*}

MOTS-CLÉS. — Environnement; Atténuation; Insécurité alimentaire; Durabilité; Population.

RÉSUMÉ. — Madagascar est un pays tropical possédant une grande variété d'écorégions et de climats, allant du nord à l'extrême sud du pays. Les écorégions les plus humides se répartissent sur la partie orientale du pays, et celles plus sèches sur la partie occidentale, avec un accent plus prononcé sur les régions du sud de Madagascar. Les régions les plus concernées par la sécheresse sont Androy, Anosy, Ihorombe et Atsimo Andrefana. Ces dernières possèdent la plus faible quantité de ressources en eau du pays et subissent depuis quelques décennies une sécheresse de plus en plus marquée combinée aux effets du changement climatique, se manifestant notamment au niveau de sa fréquence et intensité, et de l'insuffisance chronique en eau.

Cette situation entraîne de nombreux effets néfastes dans presque tous les domaines, entre autres de graves crises d'insécurité alimentaire et de malnutrition qui touchent principalement les enfants. En effet, 1,14 million de personnes sont estimées en situation d'insécurité alimentaire sévère (ONU, 2021). La précarité qui y règne pousse les populations à fuir pour rejoindre des zones plus propices où la nature offre diverses richesses à exploiter, et migrent principalement dans les aires protégées, y entraînant la déforestation avec de graves séquelles.

Face à cette situation alarmante, des actions ponctuelles et à long terme ont déjà été initiées au niveau des différents secteurs afin de combattre la sécheresse et ses séquelles dans le Sud. Malgré la multiplicité des actions, le phénomène ne cesse de s'aggraver. L'inefficacité des mesures prises relève de la sectorialité des actions et du manque de proactivité des décideurs, ainsi que de l'absence de politiques de développement du Grand Sud de Madagascar.

La détection précoce des impacts de la sécheresse, de la fluctuation saisonnière des précipitations et de la disponibilité des eaux souterraines sont donc utiles pour fournir des alertes en vue de prévenir les éventuelles pénuries d'eau et les famines. Ces informations aideront les décideurs et les parties prenantes dans la planification des interventions d'urgences, et dans la mise en œuvre de mesures d'atténuation de la sécheresse (entre autres les plans d'action en matière de reboisement/restauration) afin de prévenir la désertification de la zone. Elles serviront également d'éléments de décision pour orienter, adapter et mettre en adéquation les stratégies et politiques sectorielles, en vue de la formulation de politique de développement pour le sud de Madagascar ainsi que la planification opérationnelle y afférentes.

Ainsi, cette étude projette d'étudier les impacts de la sécheresse, avec un regard particulier pour les impacts sur l'état des sources d'eau afin de pouvoir proposer des mesures pratiques d'atténuation et/ou adaptation en adéquation avec les réalités locales et tenant compte des compétences locales, afin de pérenniser la disponibilité et l'approvisionnement en eau dans la zone. La méthodologie s'appuiera sur une démarche analytique des impacts socio-éco-environnementaux dans la zone d'étude, avec un regard de réflexion sur les dynamiques actuelles ; l'analyse des relations entre la variation des paramètres climatiques et la disponibilité en eau sera également réalisée ; enfin une observation des états des sources d'eau complètera la démarche. Les données de base seront issues de la documentation, la collecte et enquête auprès des populations locales, personnes et organismes ressources, des données satellitaires.

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The Nilgiri Archaeological Project: Reconstructing an unwritten history

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KEYWORDS. — Indology; Material Culture; Environmental History; Subaltern Studies; South Asia.

SUMMARY. — The role played by indigenous communities around the world as history makers besides urban polities was long neglected. Non-monumental material cultures combined with the primacy of orality over writing often relegated these groups to a silent role on the stage of classic historiography.

The Nilgiris, a montane region of subtropical forest in the Western Ghats of India, are inhabited by several indigenous groups. Indian and colonial sources depict them as a-historical and secluded from lowland societies. However, recent studies proved this view to be incompatible with the fact that since the antiquity forest products (spices, medicinal plants, timber, ivory, animal skins etc.) from Southern India were protagonists of the Indian Ocean exchange network. While these trades were administered by urban polities, the identification and extraction of the forest products could not have taken place without engaging peoples inhabiting the forests.

How the forest-dwellers and other inhabitants of the Nilgiris would relate to the lowland urban societies; in what cultural-economic exchanges they were involved; how they interacted with the mountains around them and what was their traditional ecological knowledge: within the Nilgiri Archaeological Project I tackle these research questions moving across material culture studies, historical ethnobotany, archaeology.

While I document museum collections in India, Italy and the UK which consist of archaeological and ethnographic artefacts from the Nilgiris, I also study the *Hortus Indicus Malabaricus*, a 17th-century treatise on the medicinal plants of the Western Ghats. On the Nilgiris, I conduct surveys to investigate the cultural context of the funerary structures dotting the landscape (dolmens with figurative carvings). To this end, such activities confirmed in different ways the interaction between uplands and lowlands.

The fast-paced transformations affecting regions like the Nilgiris (deforestation, mass tourism etc.) make the understanding of their long-term history essential to protect both their human heritage and environment.



The Nilgiris District, Tamil Nadu, India.

Map: Letizia Trinco

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Chemical composition of tourmaline textures in the outer zones of the Emmons Pegmatite (Maine, USA): Evidence for boundary layer formation

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Philippe MUCHEZ¹ & Mona-Liza C. SIRBESCU³

KEYWORDS. — Mineral Intergrowths; Anisotropic Textures; Geochemistry; μ XRF; EMPA.

SUMMARY. — Pegmatites are igneous rocks, characterized by having very coarse grains, up to more than a meter long. Anisotropic textures, such as unidirectional solidification textures and mineral intergrowths, often occur in the outer zones of pegmatites. Several theories for pegmatite formation exist, but it remains unclear how they are exactly formed.

In this study, tourmaline-bearing samples from the outer zones of the Emmons Pegmatite in Maine, USA, are studied to examine the processes occurring during disequilibrium crystallization under large degrees of undercooling. Tourmaline is a boron bearing mineral with a large chemical variability and stability range, which records the chemical signature of its crystallization environment. Detailed petrographic studies were carried out to identify textures, morphology, and inclusion assemblages. Geochemical techniques, such as μ X-ray fluorescence mapping and electron microprobe analysis (EMPA) access the compositions of the tourmaline. Three different tourmaline textures were observed: comb-like tourmaline, with prisms of larger tourmaline growing inwards from the border, radiating tourmaline, with smaller prisms nucleating at a common point, and quartz-tourmaline intergrowths (QTIs), with one larger, tourmaline surrounded by skeletal intergrowths between tourmaline and quartz (see photograph).

The geochemical study showed that the tourmaline composition varies on different scales. The variation between the three textural groups has been attributed to progressive magmatic evolution as the pegmatite dike crystallizes, while that between cores and rims of the tourmaline is attributed to sector zoning. We have linked the morphological and compositional changes to the skeletal tourmaline in the QTIs crystallizing from a thin boundary layer formed around the first, central tourmaline. Our study provides the first example of boundary layers in natural pegmatites. Studies on fluid inclusions are being performed to examine the role of fluids during the crystallization in the outer zones of the pegmatite.

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Sécurité alimentaire et résilience des ménages ruraux en Afrique de l'Ouest: Cas des communes de Diabo et de Diapangou dans la région de l'Est au Burkina Faso

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MOTS-CLÉS. — Sécurité alimentaire; Résilience; Ménages ruraux; Burkina Faso.

RÉSUMÉ. — Au Burkina Faso, ces dernières années, l'insécurité alimentaire et la vulnérabilité ont connu une exacerbation en raison de la crise sécuritaire. En témoins, en mars 2020 près de 1 606 484 de personnes se trouvaient en situation d'insécurité alimentaire (CNA, 2020). C'est dans l'optique d'enrichir les connaissances sur les conditions de vie des ménages ruraux et de fournir des informations décisives aux politiques que cette étude a été initiée dans la région de l'Est qui est en proie à l'insécurité en vue d'analyser la situation alimentaire des ménages, identifier les déterminants de la sécurité alimentaire et d'en mesurer la résilience. Pour ce faire, une enquête a été conduite auprès des chefs de ménages et complétée par des entretiens avec les chefs de services techniques de l'agriculture et de l'élevage ainsi qu'avec des commerçants de denrées alimentaires. L'approche consolidée pour le rapportage des indicateurs de sécurité alimentaire (CARI) (PAM, 2014) et l'approche Resilience Index Measurement and Analysis (RIMA) (FAO, 2016) ont été les outils d'analyse utilisés. L'approche CARI a permis d'estimer la prévalence de l'insécurité alimentaire à 31,7 % dans la zone d'étude. Aussi, quatre ménages sur cinq dépendent exclusivement de leur production pour leur consommation céréalière et légumineuse. Près de trois ménages sur quatre consomment des légumes issus de leur propre production. S'agissant des déterminants de la sécurité alimentaire, les variables telles que la localité; la taille du cheptel; l'utilisation des intrants agricoles; la possession de matériel agricole; les épizooties; le sexe du chef de ménage; la superficie exploitée et le revenu ont permis la construction par régression binaire d'un modèle de prédiction de la probabilité qu'un ménage soit en sécurité alimentaire avec une précision de 75,4 % et un P value (0,000) hautement significative au seuil de 5 %. Toutefois, les variables sexe, superficie et revenu n'ont pas été significatives au seuil de 5 %. Concernant la résilience, avec l'approche RIMA l'Indice de capacité de résilience (RCI) moyen a été estimé à 0,46, ce qui est très loin de 1, donc très peu sont les ménages résilients dans la zone d'étude. Le RCI moyen des ménages dirigés par des hommes (0,40) est légèrement supérieur au RCI moyen (0,34) de ceux dirigés par les femmes. Par ailleurs, le groupe des ménages en sécurité alimentaire a un RCI moyen (0,55) supérieur à celui des ménages en sécurité alimentaire limite qui est de 0,40. Ce RCI moyen est aussi supérieur à celui du groupe des ménages en insécurité alimentaire modérée qui est de 0,32. Cela traduirait qu'il existe une relation entre la sécurité alimentaire et la résilience des ménages en zone rurale.

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Bat sonotype as a novel insight into the Congo Basin Rainforest dynamic

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KEYWORDS. — Forest Dynamic; Bats; Acoustic Monitoring; Ecosystem Services; Yangambi Biosphere Reserve.

SUMMARY. — Tropical forest ecosystems are undergoing an exponential regression of their surface areas with subsequent habitat loss and fragmentation. The effects of such disturbances on bats are quite significant, even leading to a decline in populations. In order to ensure the maintenance of bat populations, it is thus important to preserve their habitats. This involves highlighting preferential habitats but also factors related to their foraging sites.

Here we have combined acoustic surveys and capture-mark-recapture methods to study relationships between bats and their preferred habitats and also to identify functional role of bats captured or recorded in their habitat. A total of 42 bats were captured, belonging to 13 species, including 5 species of frugivorous namely *Casinycteris argynnis*, *Epomops franqueti*, *Megaloglossus woermanni*, *Myonycteris torquata* and *Scotonycteris bergmansi*) bats and 8 insectivorous bats (*Hipposideros beatus*, *H. fuliginosus*, *Hipposideros sp.*, *Macronycteris gigas*, *Nycteris sp.*, *Neoromicia nana*, *Pipistrellus sp.1* and *Pipistrellus sp. 2*).

The frugivorous bats *Scotonycteris bergmansi*, *Casinycteris argynnis*, *Myonycteris torquata* and *Epomops franqueti* were associated with dispersal of 16 plant species in the Yangambi Man and Biosphere Reserve while the species *Megaloglossus woermanni* ensured the pollination of the species *Maranthes glabra*.

Acoustic monitoring revealed the presence of 11 sonotypes namely of the following species: *Chaerephon pumilus*, *Macronycteris gigas*, *M. vittatus*, *Doryrhina cyclops*, *Rhinolophus fumigatus*, *Neoromicia nana/Scotophilus dinganii*, *Pipistrellus nanulus*, *P. rueppellii*, *Nycteris arge*, *Myotis bocagii* and *Glauconycteris superba*.

Our results suggest that the type of habitat (primary forest) significantly influences the foraging activity of bats. A medium to high density of the understorey and a medium opening of the canopy have a significant impact on bat activity and call structure. The complementarity of acoustic monitoring and capture is crucial to understand the mechanisms governing aggregation of bat assemblages in order to assess their activity and the ecosystem services they provide.

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Gestion des ressources en eau du bassin versant de Guitti au Burkina Faso dans un contexte de changement climatique

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MOTS-CLÉS. — Ressources et besoins en eau; Changement climatique; Modélisation; Bassin versant; Burkina Faso.

RÉSUMÉ. — Au Burkina Faso, à l'instar des pays sahéliens, il existe une rude compétition entre les usagers de l'eau dans les bassins versants, particulièrement au niveau des retenues d'eau. Les ressources en eau du bassin versant de Guitti sont soumises à la fois aux pressions anthropiques et aux effets du changement climatique (Sontié, 2006; Traoré, 2012).

Cette étude est réalisée pour comprendre la dynamique de la disponibilité des ressources en eau et la demande au regard du taux d'accroissement de la population et des tendances climatiques. Il s'est agi de prévenir les écarts entre l'offre et la demande, mais aussi d'adopter des stratégies d'adaptation aux besoins pour une meilleure gestion de la ressource.

L'approche méthodologique adoptée est basée sur une analyse des données climatiques mensuelles (pluie, température, vent) de la période de 1981-2017 des stations de Ouahigouya, Titao, Gourcy et Baraboulé (ANAM, 2019) et des simulations des demandes et des besoins à l'aide d'un outil d'allocation.

Les résultats indiquent une augmentation de la température moyenne de 0,5° C entre 1992-2017 par rapport à 1981-1991 et une hausse moyenne de 43 % de la pluviosité dans le bassin versant au cours de la période 1990-2017. Les simulations faites avec le modèle WEAP prédisent qu'à l'horizon 2034, les ressources en eau du barrage de Guitti ne permettront plus de satisfaire les besoins en eau des usagers si la population de la zone s'accroît de 3 % et sous l'effet du changement climatique. Cependant, l'adoption des pratiques agricoles adaptées et la réduction de l'évaporation sur le plan d'eau à travers des techniques innovantes permettent d'atteindre l'équilibre entre l'offre et la demande au niveau de la retenue de Guitti à l'horizon 2050.

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